

June 5, 1961

Aviation Week

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AVIATION CALENDAR

(Continued from page 5)

World Petroleum AFB, Denver, Colo.
June 26-28—19th National Convention on Motor Electronics Institute of Radio Engineers, Sheraton Hotel Washington
June 26-28—European Symposium on Space Technology, Royal Aeronautical Soc. at London, England
June 26-28—Special Technical Conference, American Institute of Electrical Engineers, Vancouver, Vancouver, Canada; Regina, Regina, Saskatchewan, Canada
June 27-28—International Symposium on Nuclear Astronautics, Santa Barbara, Calif.; Center, Capt. J. L. Gibson Air Force Base, of Scientific Research, Wash. region, D. C.
June 28-30—Joint Aerospace Control Conference, University of Colorado, Boulder
June 28-30—1st Annual Meeting, Institute of Navigation, Williamsburg, Va.
July 6-12—19th Annual AIAA Convention, Conference and Exposition, San Diego, Calif.; Atlantic City, N. J.
July 12-14—1st Joint Conference on Space Systems, National Aeronautics and Space Administration, Washington, Wash. region, D. C.
July 14-15—General, Regional, Meeting, Association of Local Transport, American Public Inc., Atlantic City, N. J.
July 24-26—Naval Traffic Control Conference, Electronic Warfare Symposium, Dayton, Ohio; Washington, Wash. region, D. C.
July 25-Aug 16—International Trade, Fair and Exposition, Philadelphia, McClellan Place Convention Center, Chicago, Ill.
Aug. 14-16—Fourth Western Regional Meeting, American Association of University Scientists, Hotel San Francisco, Calif.
Aug. 17-18—Conference and Navigation Conference, American Institute of Aeronautics and Astronautics, Palo Alto, Calif.
Aug. 19-21—Computer Engineering Conference, University of Michigan, Ann Arbor
Aug. 19-21—International Symposium on Space Systems, American Institute of Aeronautics and Astronautics, Palo Alto, Calif.
Aug. 19-21—Conference on the Aerospace Sciences, Naval Aviation Meeting, San Diego, Calif. (Chalkdell)
Sept. 12-14—19th Annual Meeting, American Institute of Aeronautics and Astronautics, San Francisco
Aug. 24-26—19th Annual National Aeronautics and Astronautics Meeting, Hotel Waldorf Astoria, New York
Sept. 4-10—19th Flight Design and Production Society of British Aeronautics Conference, Portsmouth, England
Sept. 4-14—English Aeronautics Conference, Institute of the Aeronautical Sciences, London, England
Sept. 6-8—National Symposium on Space Electronics and Telecommunications, University of New Mexico, Albuquerque, N. M.
Sept. 10-13—National Conference, National Aeronautics Association, Washington, D. C.
Oct. 27-29—19th International Astronautical Congress, Washington, D. C.
Oct. 15—American Rocket Society—10th Annual Meeting & Space Flight Report in the Cosmos, Columbia, New York, N. Y.

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Here's a brand of inflation that's easy to take—Goodyear's inflatable structures that can take to the air in folded form. Minimum set-up time, 10 minutes. Lightweight, shatter-resistant, fast force.

Shown above are a few recent developments in rubber and fabric by Goodyear.

① **Fast Form of Pillow Tents**—these huge enclosures can be set up, filled and pumped in minutes. Described, then roll up the bags for compact storage and transport. Capabilities to 50,000 gallons or more.

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③ **Personnel Shelters of Air Mat** fold into light packs,

inflate in minutes. Provide comfort and protection in worst weather. Ability to hold air eliminates air-leaks and need for constantly running compressor.

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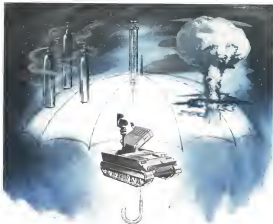
Portable—lightweight—super-tough—flexible—these are the product qualities you can count on in Goodyear inflatable. But the real secret is Goodyear's design-engineering ability to fashion rubberized fabric into shape and construction you'd never think possible. And the odds are that our staff can fabricate the answer to your problem. Find out by writing on company letterhead to The Goodyear Tire & Rubber Company, Aviation Products Division, Dept. F-1713, Akron 16, Ohio, or Los Angeles 34, California.

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BATTLEFIELD PROTECTION AGAINST C-B-R ATTACK

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For details, write Preliminary Design Engineering Dept., FMC Ordnance Division, P.O. Box 287, San Jose, Calif. Phone: CYpress 6-8124



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Putting Ideas to Work

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FUEL... Fuels and defuels any type aircraft with either single-point or conventional service. Delivers 60 GPM of any fuel from 5,000 gallon capacity. Removes all water, foreign matter from fuel. Operates from -20 to 120°F. Road speed of 50 mph, fully loaded.



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"OXYGEN IS GO! ALL SYSTEMS ARE GO!" In these words Commander Alan B. Shepard, Jr. informed the waiting world that the Project Mercury spacecraft (McDonnell Aircraft, prime contractor) is a record of reliability throughout all its systems, all its components.

As a Project Mercury subcontractor, Tapco designed and manufactures miniature amplifiers with unique circuitry for monitoring body functions and environment. These units are vital to the system that measures and telemeasures the heartbeat and body temperature of the astronaut and the amount of oxygen in his breathing atmosphere, allowing him to take corrective action when necessary. Performance of the units throughout the historic May 3 shot: AOK.

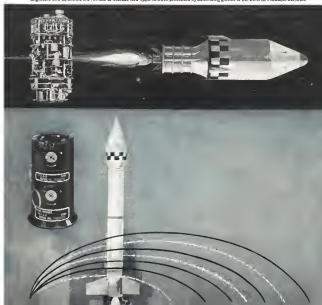
The ability to create unusually reliable devices for space science and weaponry is primary at Tapco. That is one reason we are part of such projects as Mercury, and Scout I, Scout II, Fireball, X-15, and the satellite solar power system Sunflower I.

PROVEN IN FLIGHT... Fairchild Programmers, Fuzes, Safety and Arming Devices

Ordinance products furnished by the Defense Products Division are securing our nation's urgent need for reliable, sophisticated systems and components. Integral programming, altitude fuzing, safety and arming devices, mechanical and electronic timing systems are designed and produced for special environmental requirements to close tolerances. The rugged, trimounted, lightweight programming are performing vital control functions in current ordnance projects. Fairchild fuzes, also in operational use, are precision designed for high reliability application in surface-to-surface, air-to-air and air-to-ground weapons. Safety and arming devices for long-range ballistic missiles have been successfully developed and produced in quantity. For further information on how this capability can help your ordnance requirements, write the Director of Marketing, Defense Products Division.



Engineers and scientists are invited to discuss new opportunities presented by continuing growth of the Defense Products Division.





From jet aircraft and satellites to automobiles and fractional horsepower motors, Purolator filters are part of advanced engineering design.

Scary-Bre Purolator filters perform vital functions on the Boeing 707, 720, Douglas DC-8, Convair 440 and Cessna 441. Purolator filters form an integral part of such mobile systems as the Hawk, Falcon, Jaguar, Atlas Terror and Hawk Dog.

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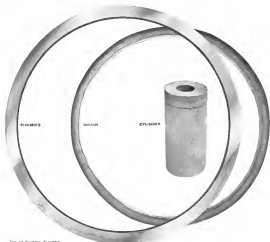
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Equipped with a Lycoming TVO-435 engine with a T-11 AllResearch exhaust drive supercharger plus the only rotor system capable of using all available power efficiently, the 47G-3B has the highest performance ever built into the Model 47 series.

With a takeoff rating of 260 hp. and a continuous rating of 220 hp., this superpower craft delivers a constant envelope of performance from sea level to 15,000 feet.

The 47G-3B is a further development of Bell's 47-GB which made world-wide aviation news in 1959 with unprecedented lifting, hovering and subnormal maneuvers at density altitudes over 15,400 feet and down to sea level.

Now, this turbo-supercharged 47G-3B gives business industry and the military a more useful, more versatile helicopter. It is backed by Bell's 3-million-plus-hours of flight world-wide, and Bell's proven leadership in turbo power for dependability, safety, economy of operation and maintenance. Write or wire Dept. 35-86 for complete information.



BELL HELICOPTER COMPANY Fort Worth, Texas
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GASKETS in Design Engineering



Now, with the Garlock GARDIAN® Gaskets, solve the problem of high temperature, limited space sealing on motors and almost exhaust control turbines, after equipment.

At last—a special-wound gasket to fit better than a wedding ring! Ideal for limited space in tight engine applications, this new Garlock GARDIAN Special-Wound Gasket is available in thicknesses as thin as $\frac{1}{16}$ " in gaskets up to 6" I.D., maximum diam. with 5".

Controlled density affects motor position and. During manufacture of the new "wedding ring" GARDIAN Gasket, the proper selected thickness of filler material and preformed metal, the number of laminations of filler and metal, and the correct tension of filler and metal while being formed into a gasket are the factors engineered to achieve proper gasket density. By controlling and varying these factors, Garlock is able to match the density to the pressure range. The built-in quality is consistently checked by a Baldwin-Lucas Ham-Line compression-testing machine, thereby assuring perfect sealing regardless of different pressures and different bolt-load requirements.

High-temperature, high-torque construction This new Garlock "wedding ring" GARDIAN Gasket operates effectively at temperatures as high as +2000°F and pressures to 2500 p.s.i. or more. It is an excellent gasket where recording temperatures are encountered. In the 700°F to 1200°F range, Garlock uses a compressed asbestos filler with stainless steel plate, in the 1200°F to 2000°F range, a ceramic filler is used with several different types of metal plate, depending on customer preference. The ceramic is non-flammable, completely nonsparking, and an outstanding thermal insulator. It resists mold, scaling, and aging, thereby allowing indefinite shelf life.

Where service is scarce and space at a premium, use new Garlock "wedding ring" GARDIAN Gaskets. They may be the answer to your sealing problems. Find out more from your Garlock representative. Call him at the nearest of the 26 Garlock sales offices and warehouses throughout the U.S. and Canada. Or write Garlock Inc., Palmyra, N.Y.

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Order from the Garlock 2,000...two thousand different styles of Packman Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

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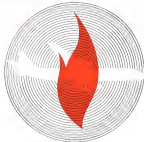
This is the Northrop Y-38. Soon every U.S. Air Force student pilot will step into this cockpit for his basic training in high-performance supersonic flight.....

He will step out, after completing his training schedule, qualified to fly the most advanced single or multi-engine aircraft in our inventory. The T-38 is now in active service with the U.S. Air Force.

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From Thomas A. Edison Industries...



FAST, RELIABLE FIRE DETECTION FOR AIRCRAFT

Edison's continuous cable fire detection system provides instantaneous warning to pilots in case of engine fire. This fast action means corrective measures can be taken before serious damage results. In this Edison system, high speed air-response is coupled with unique reliability. There are no blind areas in the detection loop. It responds to heat at any and all points and will operate even if cable is broken. It has no moving parts... no electronic tubes... no shielded leads... no complex recovery... is vibration and shock resistant.

Designed for simplicity and flexibility, a single loop can protect areas of varying temperature conditions. Rugged cable is available in various lengths and can be installed easily.

Edison's close collaboration with aircraft manu-

facturers has produced continuous design improvements, increasing the reliability of this system in such increasingly difficult performance environments.

For example, measure-point connectors were developed for the F-106 which are capable of continued use at 1,000°F.

This is another example of how Edison can bring progress of research, development and manufacturing in paying off in more reliable components and systems for aircraft. Edison fire detection is now in use on many of America's most modern commercial and military planes, including Douglas DC-8, and C-119, Fairchild F-27 and Convair F-106. Write for complete engineering and installation data.

Edison's continuous cable fire detection system provides instantaneous warning of fire. Responds automatically when fire is met. Edison system gives complete protection for jet and reciprocating engines. Cable is a continuous element resistant to heat at all points.



Thomas A. Edison Industries
INSTRUMENT DIVISION

40 LAKEVIEW AVENUE, WEST ORANGE, N.J.





MINUTEMAN

In 1957, the Air Force Ballistic Missile Division, now the Ballistic Systems Division, awarded Space Technology Laboratories, Inc. a contract to study the feasibility of a solid propellant, multi-stage, intercontinental ballistic missile. When that study demonstrated that such a missile system was technically feasible, STL was awarded a contract to provide systems engineering and technical direction for the program to bring the system into being.

Design intent for the system and its subsystems were prepared by STL as a member of the industry team which, under the leadership of the former Air Force Ballistic Missile Division, set about the task of creating the Minuteman system. Guided by the principle of concurrency and spurred on by the same appetite for all-upgoing which marked the development of those other Air Force weapon systems in which STL performed systems engineering and technical direction—Atlas, Thor and Titan—this industry team met the rigorous time schedule established for the program. The first captive test of the missile was made on 18 September

1959 the exact date scheduled eighteen months earlier. The dramatically successful first flight test of Cape Canaveral on 1 February 1961 occurred within weeks of the programmed date.

The Minutemen of STL are proud of their role in the development of the Minuteman system and of their association in that program with Boeing Aircraft Co. (assembly and test), Autonetics Division of North American Aviation (guidance and control), Thiokol Chemical Corp., Aerojet General, and Hercules Powder Co. (propellants), and Aero Corp. (re-entry vehicle).

Minutemen has passed its first research and development flight test. Ahead lies the work of completing the ground system and missile development, and of bringing the system to operational readiness. These tasks require qualified engineers and scientists to train STL's Minuteman team in both Southern California and Cape Canaveral. Those capable of contributing to this important program in Space Technology Leadership are invited to write Dr. R. G. Foster, Manager of Professional Recruitment and Development, at either location.

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EDITORIAL

Resurgent French Industry

Convincing proof of the remarkable resurgence of the French aircraft industry is evident in the exhibitions and technical work surrounding the 24th International Air Show at Le Bourget during the past week.

During the early 1950s the French aircraft industry had a hard time rising phoenix-like from the ashes of World War II to rebuild its technology and production facilities into the capability for competing successfully in the post-war marketplace.

During these difficult years the French made considerable heavy investments in relation to their total resources to research and development, getting experimental prototypes into the air and retooling with the latest production methods.

While this phase was under way, the French also consolidated their numerous smaller companies into several solid teams, securing both governmental and private grants and subsidies to ensure the viability of technical and commercial competition. It is interesting to note that the French made this significant consolidation some four years before the British aircraft industry faced a similar problem.

Now it is evident that this reinvestment is paying substantial dividends in providing France with a technically modern aircraft and missile industry that can stand its own industry and meet requirements for French-owned contractors in Africa, Asia and Europe, can command a substantial share of the growing NATO market through joint design and production programs with other countries, and also is emerging as a strong competitor in international export markets.

One of the best statistics by which to measure the current French aviation industry is its success in the latest competition for foreign markets. Last year about 47% of the industry's 3,446 million sales was accounted for in the export market. This year about half of all French aviation aircraft and missile sales will be in foreign markets. The French have made a significant if relatively unpublicized penetration into the U.S. market with Turbomec's small gas turbines, Cassinelli transports and Alouette helicopters. We now look forward to increasingly stiff competition from French far-west-powered executive transports in the near future.

Two more significant facts bear the success of the French industry in a recent year in selling against stiff British competition in what were traditionally Core marketable markets. For example, India bought six new Dassault Mirage IV fighters and recently pulled the Braguet Alouette anti-submarine warfare plane over the British Frigate Corbet and has also pulled the Dassault Mirage III for its Mach 2 plus interceptor. In Australia the French beat the U.S. and British competition with their Mirage III for the Royal Australian Air Force and also sold the Sirocco Atlas 9 transport to prove it in this traditionally British export market. The Soviet Government took place in what looks to be one of its British and Canadian competition in Australia's relatively large market for this type aircraft. South Africa is giving the Mirage III airframe consideration.

In the helicopter field more than 800 gas turbine-powered Sud Aviation Alouettes have been sold to 20

countries while French lightplanes such as the Morane Sachser gas-powered Pave and the piston-powered Rallye are selling well throughout Asia, Africa and Europe—about 150 Rallyes have been sold so far.

In the missile field, Nord Aviation is currently Europe's largest producer of missiles.

By the end of 1960 Nord had built 73,000 nuclear and target missiles and its longest target missiles, anti-tank weapons and anti-ground missiles are being sold abroad and are being built in foreign firms under license.

The French aviation industry has also been successful in getting its share of its growing NATO market for aircraft and missiles. Starting with the earlier Nord Atlas transport and Frigate Magister fighter programs, the French have built up a substantial NATO market through cooperative programs with Germany, Italy, Great Britain and other participants in the alliance. Currently this includes the Transall cargo transport being built in Nord with German assistance and Bristol Type turboprops, the Braguet Alouette anti-submarine warfare plane in which five NATO countries are involved, and Sud Aviation's Pave helicopter program using technical aid from U.S., Italy and Germany.

In addition, the French are making strong bids for both NATO VTOL fighter and STOL transport requirements. The French have concentrated heavily on developing in early STOL transport capability based mainly on requirements for operations in the French-occupied sphere of newly-independent African nations but which also is appealing increasingly attractive for the export market in underdeveloped countries where an transport development is vital to overall economic improvement and where resources are not available for large-scale airport construction.

Perhaps the most controversial issue now facing French industry is whether it is necessary to develop an atomic striking force of Mirage IV bombers and IRBMs to be. France's seat in the international atomic weapons club and whether this financial and technical effort will attract the industry to the point where other promising developments may have to be abandoned. France also is determined to develop its IBM capability and participate with growing effort in space technology. Carrying all this load may prove difficult in view of the limited size of French research and production facilities, plus the increasing competition for skilled workers with other expanding industries such as automobiles, electronics and chemicals. The French have relied on technical interchange with the U.S., Britain and now Germany's outstanding aerospace technology and are engaged in pushing hardest into gaps left by the major competitors in the ever-all aerospace spectrum.

France can be pretty proud of the position its aviation industry now occupies in the world and of its success in international markets. It will, however, take an effort even greater than that of the past decade to maintain this position in the aerospace world in the next decade where the excellence of each nation's technology and its application to its own particular problems will be more important than ever before.

—Robert Holt



D DAY, THE LACK OF RECONNAISSANCE AND A FAULTY COMMAND

At 10:15 p.m., June 5, 1944, Lieutenant Colonel Meyer, commander of the 1st Luftwaffe Reconnaissance Group, was in his command tent, managing a radio game of cards. He held a message intercepted from Allied Headquarters, a message the German General Staff knew meant Allied invasion within 48 hours! But the card game placidly continued. When no reconnaissance verification. Though a 5,000 ship, 20 mile wide invasion fleet clogged the English Channel, not a single Luftwaffe plane reported the progress. And so Field Marshal Kessel, commander of German forces in the area, was not alerted until after it had well commenced an invasion in Germany. Later, urgent pleas for paratrooper divisions in reserve near Paris were rejected by higher authority in Germany who thought the Normandy invasion was merely a diversion.

Why such confusion, particularly when Roosevelt's

military states included the study of Confederate generals with their depend on the "soft reconnaissance" eyes of J.E.B. Stuart's cavalry? Answer: unlike the reconnaissance-wise Confederates, Roosevelt's "eyes" were obsolete for their day. After aircraft, obsolete for the age of reconnaissance, invaded. Result: lack of reconnaissance. D-Day success for the Allies.

From the beginning of civilizations on the face of the earth, reconnaissance has helped shape history. Today GAI's specialty in this area is helping shape history to the advantage of the Free World. Types of GAI reconnaissance are: V.I.P. Visual Inspection; Photographic; Electronic; Radar; and the world's most versatile aerial system, **BOLDO**, the only truly optimal "invisible star" guidance system.



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WHO'S WHERE

In the Front Office

Joseph Kelly, Jr., president and general manager of Allied Research Associates, Inc. (ARAI), a subsidiary of The Boeing Co., succeeding Lawrence Levy, who has headed a government post.

E. H. van der Boeg, president, KLM Royal Dutch Airlines, succeeding J. A. van der Boeg, who has been appointed a director of KLM.

Arnold Samuelson, president, has approved the acquisition of John H. Babel, a deputy director of defense research and development. Fred H. Spitzer, in military service of the Army, England and military service of the British, is in military service of the Air Force (British and military).

William E. Natus, vice president and director of advanced systems, Motorola Inc., South Pasadena, Calif.

Harry E. Schenck, a vice president and director of engineering, U. S. Systems Corp., Los Angeles, Calif.

Richard D. Leonard, a director, Chicago Aerial Industries, Inc., Birmingham, Ala., is replacing the late Ernest G. Kelly, who was president of the company. Mr. Leonard is succeeded with The Marine Co.'s Title record, progress.

James A. Kasper, executive vice president, Spacelab, Inc., Van Nuys, Calif.

Blair E. Roper, vice president and managing director of General Electric Corp. (General Electric), with offices in Tokyo, is succeeding Harold F. Leonard, who will be vice president of the company.

Dr. James B. Roper, vice president and managing director of General Electric Corp. (General Electric), with offices in Tokyo, is succeeding Harold F. Leonard, who will be vice president of the company.

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Dr. James B. Roper, vice president and managing director of General Electric Corp. (General Electric), with offices in Tokyo, is succeeding Harold F. Leonard, who will be vice president of the company.

INDUSTRY OBSERVER

French arms, still without a tactical missile, is now extremely interested in the Matras Project. The French four-year military program has earmarked \$70 million for tactical missile development, and recent West German plans to buy French jets have revived French interest in this field.

Navy is pushing Germany to sell its A-6 attack aircraft in Western Europe to increase production and cut overall program costs. But modest progress in West Germany, where the A-6 would serve as an interim aircraft until NATO VTOL fighters become operational in the late 1960s.

Wick for the Spanish air force to get two squadrons of Lockheed F-104s equipped with Sidewinder missiles to bolster its defense of the Balearic Islands. They probably will be bought with U. S. Mutual Defense Assistance Program funds. Spanish air force is now re-equipping transport squadrons with Douglas C-119s but it is also working with Douglas DC-10s to provide increased ability to handle logistics in Spain's African colonies.

Norfolk still hopes to find a market for its N-16 lightweight supersonic development of the T-38 trainer as an interceptor and fighter-bomber, particularly in small countries with limited military budgets. In acquisition with USAF, Norfolk offered a firm fixed unit price of \$490,000 based on a minimum order of 600 aircraft.

Seven satellites equipped with television cameras has been proposed by Lockheed N-16 to photograph the entire surface of the moon from a minimum orbit of about 120 mi. It would take 30s of time to take 100 photos in complete circle in one orbit. The photos would be taken in an area no more than 5 km.

Navy plans to conduct the first full-scale test of its Theta weapons launch system this summer at Ft. Meigs, Calif. Annapolis, Md., the third largest launch test stage system, will be used to boost a payload to an altitude of 70 mi. Test stages on far have been powered by just enough propellant to launch the vehicle a few feet above the surface.

Gib Allen B. Stewart has recommended a change in the location of a project in the Missouri capital and modification of some of the visual communication procedures as a result of the Vietnam situation.

Seven NASA, New has advanced reconnaissance satellites are scheduled for development. Six for orbital use and one for ground testing. Current budget estimates approximately \$5 million for development and construction and about \$2 million for environmental testing.

Electronic type selection has been received from the Nuclear Weather Satellite Bureau, development studies. Main problem areas with the new advanced Atomic Reconnaissance Satellite have been identified in the variable time between current and reliable orbiting system.

Second launch in the nuclear weather satellite (NWS) program will be called NWS II. The payload will be there in the fall and will include a variety of biological specimen sensitive to various stages of selection, a full life insurance experiment and an experiment to study atmospheric flow and precipitation.

Trans-satellite satellite (TSS) data recording system is being tested from Ft. Monmouth, N. J., to NASA's Wallops Island, Va., station to test the Atomic Satellite of the operating log. The RCA-operated orbital station will be used for the launch of TSS II this summer, and it will be used for the last remaining TSS experiments.

The use of nuclear fission effects to convert the waste contains chemicals into critical fuels, explosives, etc., will be studied under contracts soon to be awarded by Air Force. A key aim of the research of processing chemicals by fission, called fission-fuel, is to lower the cost of currently expensive materials.

New Silicone Rubber Compounds Now Can Be Molded to Closest Tolerances

Looking for durable rubber compounds that offer superior molding, reliability and flexibility over a wide temperature range—where other materials have failed? Here is one example of how silicone rubber compounds come into existence to fill these requirements, through cooperation between Silcones Division engineers and their customers.

Siemens Engineering Company, Santa Maria, Calif., had a new emergency oxygen mask under development for passengers on today's high-altitude, high-speed jet airlines. They needed a rubber material with these properties:

1. Resistance to spring back to shape after being deformed.
2. Seals in oxygen to fuel centers.
3. Excellent low oxygen permeability.
4. Good color dispersion.
5. Nonswelling, noncolloidal properties.
6. No cracks or foam problems during production.

COOPERATIVE ENGINEERING

The Union Carbide Silcones Men brought these and other requirements back to the team of scientists in R&D.

Prior to this, the outstanding technical and research facilities of Union Carbide Corporation, with thousands of scientists of chemical experience and knowledge

had already achieved a long list of "firsts" in silicone rubber, including:

A controlled reactivity vinyl containing silicone rubber. A new polyethylene system for one-step curing of thick sections. Electrically conductive silicone rubber. A rubber for electrical tapes, but not dusting, and other wrapped constructions. A compound to meet Naval cable specifications for atomic submarine. And the first and only silicone rubber compound qualified for automotive use in piston seals.



FROM UNION CARBIDE—first commercial silicone compound for high-altitude emergency oxygen masks



THEM ENGINEERING COMPANY of Santa Maria, Calif., tests every silicone rubber mask it manufactures and maintains an accurate record number check to be sure the quality is uniform at all times

MEETING BASIC PRODUCTION PROBLEMS

For Santa's oxygen masks, the principal properties needed had all been met before, but not in a single silicone rubber compound. Working closely with Siemens engineers of the Silcones Division resulted in formulating a compound that matched the needs and solved all basic production problems in use.

The new compound permits molding to extremely close tolerances. Its purity means freedom from cracks and other problems. A compound to meet Naval cable specifications for atomic submarine. And the first and only silicone rubber compound qualified for automotive use in piston seals.

MAIL COUPON FOR DATA

If your designing calls for rubber with advantages such as low temperature flexibility, thermal and moisture stability or very high compression, low compression set, weather, ozone, oil resistance, electrical resistance or conductivity, write Silcones Men at Union Carbide Corp. The coupon below will bring your problems to his immediate attention.

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Space Impact Strategy

Washington Roundup

Strategy of the Kennedy Administration for gaining wide public acceptance of the post war of space exploration (see p. 26) is becoming evident. It is to spread the effort and disperse the involvement—as broadly as possible throughout the U.S. and to educate businessmen, universities, students and ordinary citizens in the importance and potential payoff of a vast research program.

First concrete example of this was the first annual National Conference on the Practical Use of Space, held recently at Tulsa, Okla. The two men behind it were National Astronautics and Space Administrator James E. Webb, a former Oklahoma businessman, Sen. Robert Kerr of Oklahoma, chairman of the Senate space committee, and Harold Sturt of Tulsa, former USAF assistant secretary.

Although Kerr and Sturt were disappointed in the turnout of businessmen, the conference set the pattern for future "road shows" and generated a going-ahead for launch of next year's event. Sen. Warren Magnuson, a member of the Senate space and appropriations committees, wrote it held in Seattle, Wash., in the second week of May. Sturt wrote it returned to Tulsa.

Kerr put the space race in terms one Oklahomans could appreciate by saying it will cost an average of 17,000 barrels of crude oil to produce the revenue needed by the first stage of a single Saturn booster, and he pointed to the number of business and university space contracts in the state.

President Kennedy said the conference a message calling space research and exploration "the new heart of our national policy" and predicting "a far-reaching effect within industry and in our labor force, an increase in research, education and many other areas of national activity." He said he hoped the conference would "establish a precedent in the people of America never before in space."

Forecasting Costs

Congressional demands for long-range defense planning—most of them aimed at forecasting costs—are increasing. Bills have been introduced that would direct the Secretary of Commerce to study the economic impact of defense and submit a new congressional estimate in which this year. Defense Secretary Robert McNamara already has decided that he hopes to tag the cost of weapon systems five years into the future.

Second flight of a U.S. astronaut now appears to be off until mid-July, about the time NASA calls its prospective Apollo bid. Second flight was set for the week of June 25, then for the week of July 2, now has slipped to the week of July 16.

Three-year committee that recommended a merger of the Air Line Pilots Assn. and the Flight Engineers International Assn. may be forced to postpone and issue more explicit and detailed recommendations. Contract negotiations between airlines and FEA had bogged down pending the commission's report. They may resume at a fly-in between FEA and the airlines just next week in Miami.

Cooperation between the two sides in adopting the findings would save 300 new jobs, says the report.

Commerce Department's plans for an Office of International Travel, which is supposed to increase tourist trade to the U.S. by 30%, are getting the fast-track treatment. They now call for both hard and soft skills, with strong managers and well-trained tourist office in London, Paris, Frankfurt, Geneva, Tokyo and an unnamed city in Australia. Road signs and brochures alone would require \$450,000—almost five times the other, present investment budget of \$105,000.

Commerce wants about \$1 million for the task, and President Kennedy is expected to push hard for this permission (even in the belief that more tourists will improve a bank balance of payments situation and international relations).

McGellan Strike Ban

Sen. John F. McGellan has proposed a stiff bill "to prohibit" strikes and lockouts at space installations. It would fix to have legislation passed over the heads of contractors and unions in the case of strikes or lockouts caused by the Kennedy Administration, or not to be fixed.

Sen. McGellan told Aviation Week he will introduce the bill—already drafted by his staff—before Congress adjourns for the summer. Although prospects for its passage are dim, better labor trouble would heighten them considerably, as even the proposed legislation should serve as an incentive for peace at the missile lines.

Among the labor wars for Pentagon agencies and press releases these days is "war" even the "wild war" must be called a "political and technological struggle." A general recently scheduled a relay in which he referred to the N's as the "Man O' War" of the research research strike. Second stage of the proposed relay with the suggestion that he call the aircraft "the Seaboard" or "the Outback" of the research strike instead.

—Washington Staff



ASAC Apollo module, as conceived by NASA, will be essentially identical for earth orbiting, circumlunar and manned lunar landing missions.



Possible configurations are all conic-like shapes. Decision has been made to concentrate on parabolic recovery.



HARSTEN CO. drawing of manned space station laboratory (SASOL) shows earth-orbiting vehicle sending out a line with an infrared sensor to maintain with a permanently orbiting station. Research body gradually resembles Martin's Apollo concept, since Martin says it is adaptable to earth and circumlunar orbits and can be fitted for a lunar landing. "Lunar re-entry mode is located on top of the laboratory," which is Martin's first concept.

Space Program

By Edward H. Koleson

Washington (UPI)—manned space program over the next five years will cost \$75.90 billion, and the civilian space budget will reach a \$4.5 billion annual level by fiscal 1963 under the current Kennedy Administration plan.

The Administration already had planned to spend an estimated \$15.75 billion in the next five years but had not revealed the figure. The impact of the Rights of Man, Yau-Guayou and Gale Alan R. Shepard, Jr. contributed to a White House decision to make a massive space effort that will raise both the spending level and the National Aeronautics and Space Administration's percentage of the total.

Both the White House and NASA will endorse the position that the U. S. has a good chance to be first with a manned lunar landing in their effort to push the agency's 1963 and 1967 authentic (which require through Congress). The impact of \$1,784,800,000 (AW May 29, p. 25) will be made with a certain eye made to Congress that it is probably the last civilian program to cost under \$10 billion annually.

New National Goals

NASA Administrator James E. Webb outlined the new five-year program and its characteristic the Administration's actions in accelerating the space effort as the establishment of space as a national goal, essentially in the area of manned lunar landing. Rover and/or rocket development, communications and weather satellites. However, all but one of NASA's 24 research programs have been of additional launch under the Kennedy request, and the White House actually reflects related, new

Will Cost \$25-30 Billion Over Five Years

plete acceptance of extending the program asked.

Pressure will be on NASA to produce scientific and publicly first landing to the manned lunar landing mission, but it is apparent that Webb and Vice President Lyndon Johnson have obtained general acceptance of the appropriate request in Congress.

Webb and he has "influenced the responsible leaders of Congress, with whom I have to deal as to how we are proceeding" and the Vice President has met with Senate and House space committees.

New Harmony

New harmony exists between NASA and the various Congressional committees which now moving when the agency was headed by Keith Glavin. In House appropriations knowledge last month Rep. Albert Thomas (D-Tex.), chairman of

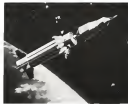
the independent office telecommunications highly complementation of Webb and the civilian space program Webb said.

Realization of funds under the new Kennedy Administration recommendations shows significant increases for

• **Apollo**, from \$25.5 million to \$160 million for research, covering NASA will avoid one or more hardware contracts this fall instead of next January (AW May 22, p. 24). Projects, budget will be broken and specifications issued in mid-July. NASA has added the lunar landing mission to the Apollo program, and now establish a 1967 budget for the national lunar landing. Earth program provided \$24.4 million for manned lunar landing of launch vehicles and spacecraft development and \$5.1 million for advanced technical development of spacecraft and component design and evaluation. The added

money accelerates hardware contracting, took eight programs, development of the critical spacecraft propulsion system, and long lead time leading to lunar vehicles.

• **Weather satellites**, from \$26.2 million to \$50.2 million permitting launch of five additional "fast satellites, two more than had been planned. Two will contain infrared sensors. The program follows the plan of the National Coordinating Committee for Aeronautics Meteorology (AW May 27, p. 27) which calls for a "fast" to be orbiting at all times until Nimbus is ready for launch probably late next year. Five Nimbus payloads will be launched at six-month intervals, and two Aeronautics weather satellites will be launched in 1964. Weather Bureau will accept \$17.5 million over the next three years, including \$4.1 million in fiscal 1963 to construct rocket stations for Nimbus.



FIN STABILIZED Science C-1 locates Apollo into an elliptical orbit in this NASA conception. Vertical and horizontal plane attitudes are being considered for the Apollo lunar landing vehicle after it completes its lunar mission.



FIRST PHOTO of Gemini super stage (below) shows during mating test with Apollo booster 1640 at Cape Canaveral FL. MLP, Modular Launcher Platform, is the structure that will carry Apollo spacecraft and 23 tons of equipment.



in Fairbanks, Alaska, Blossom Point, Md., and Alton, Canada.

- **Life sciences**, from \$8.61 million to \$14.61 million, representing a solid victory for NASA in pursuing a flight program in bioastronautics (AW May 15, p. 36). Earlier funds were insufficient to conduct a strain-free flight program aboard Skylab with the Skylab 2 mission, long-term orbiting research station, balloon flights from Barrow, Alaska, and First Churchill, Canada, helicopter balloon submersed experiments, and X-15 tests.
- **NASA research**, from \$74.3 million to \$89.3 million. This will allow NASA's own laboratories to accelerate and provide pilot support for work in rockets, guidance, structural dynamics, life support systems, materials, the separate transport problem analysis and advanced technology in warfare and communications satellites and to design-orbiting, pointing systems.
- **Structures and sounding rockets**, from \$71.7 million to \$117.7 million. The increase is designed to advance the polar-orbiting geophysical observation car to 1967, accelerate the other polar-orbiting programs in polar-orbiting, to allow solar atmospheric and geophysical observations to be obtained continuously, and provide means to advance spacecraft development which was accelerated, that the \$2 million added to the rocket launch will permit NASA to increase support of research, sounding rocket tests.

- **Launch and planetary exploration**, from \$107.9 million to \$118.6 million. This increase is tied directly to the Apollo research lunar landing mission to accelerate lunar studies of the lunar environment. Primary mission of the Prospector group has been successful to the Apollo 16, that it will be a logistics vehicle to track heavy equipment to the moon for a manned land. Prospector research is not directed at a manned vehicle, and later seen as a lunar orbit supply with the cargo hold to return samples to earth. These missions are still part of the program, but the space program is to carry equipment with it as a way of reducing the cost of the mission.
- **Communications satellites**, from \$14.6 million to \$19.6 million, which can represent a free decrease to take the increased lunar landing vehicle and the implementation of the 1-1 engine. This was no late program would the current Kennedy budget, which provides means to start work on an F-1 design, plus funds for single and clustered engine test stands. In a reversal of an Eisenhower Adminis-

tration decision to stage all super boosters in NASA, the new budget starts \$62 million to the Defense Department to develop a large solid rocket to NASA specifications, and \$15 million to adapt the Titan II vehicle for space research. NASA has been only lukewarm concerning large solids, despite congressional agitation to expedite research in this area. Titan II space vehicle launcher is expected to be the standard knowledge needs plan in Agency & development. This vehicle, according to Deputy NASA Administrator Dr. Hugh L. Dryden, would

look up "many elements of our program" in the future.

He said that there are some problems arising as to the capacity of Contractor and the weight of Advent, the Army's 25-lb. active communications satellite, "so that we must make some error in this program by sharing a vehicle based on Titan II."

Review program increase (AW May 22, p. 30) provides \$36 million for research, which NASA would like to fund in a flight demonstration vehicle under 1965, and \$15 million for a test stand.

Congress Is Expected to Support Kennedy's Space Race Program

By George C. Wilson

Washington—Congress, with some hesitations, is expected to follow President Kennedy's lead and phase the nation off the way into the space race with Russia.

Reaction to the President's second State of the Union message May 26, as well as the voting in the House and Senate, indicates in Congress and states he will get pretty much what he asked in these fields. Less certain is the key of Presidential requests for more money for space and civil defense.

The President requested a space program which would cost \$7.9 billion more over the next five years than the \$15.2 billion which the Administration last month had requested for that period.

But other Democratic leaders in Congress took what appears to be the opposite viewpoint by declaring the U.S. cannot afford to be second in space and therefore must spend whatever is necessary. Chairman Frank R. Lautenberg (D-N.J.) of the Senate Subcommittee on Space and Astronautics and the President in his speech "opened the bottom on a housing new space age. The cost will be enormous, but the pressure is on the President to get the program off the ground. President Kennedy will respond favorably to the money requests, Sen. Key said. "Indeed, there can be no price tag on national in this dangerous world."

Chairman Owen Brewster (D-La.) of the House Science and Astronautics Committee said the President's request for more \$100 million for civil defense studies in fiscal 1962 is not expected to be approved. President Kennedy will respond favorably to the money requests, Sen. Key said. "Indeed, there can be no price tag on national in this dangerous world."

Rep. Cannon told Americans Where the President's space requests are "wholly accurate and far-reaching beyond measure" and the implementation of them on the crash basis recommended would cause "real trouble."

"To defend this nation... as a matter of fact for survival," Rep. Cannon said, "we have got to reach money, to reach technical resources, to reach

strategic material, and above all to reach time. And from that we must acquire our resources to those objects where they will accomplish the most... the purpose for which they are spent must be justified." He said the spending rate for space is spending more at something "perch contemptible. Any advantage to be gained are public affairs. There is no resource we will have an effort."

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X-15 Flies Without Stability Augmentation

Edwards AFB, Calif.—Stability augmentation system of the NASA/North American X-15 failed at engine ignition in the speed record-breaking flight May 25, but test pilot Joe Walker reported no serious difficulty in controlling the airplane.

The engine failed to both push and roll smoothly at operations. Walker was able to meet the roll smoothly, but there was no stability augmentation in pitch for the majority of the flight. Normally, the stability augmentation system is an integral part in the X-15 control loop but the pilot can override it and the controls can function without it. Walker said it "only needed a little more rudder."

The objective of the high speed test was Mach 5.1, but the high speed stages between Woomers, Utah, and Edwards reported that top speed was Mach 4.9. The high speed stages were all in operation at the time of the test. The X-15 reached a speed of 3,000 mph in an altitude of 52,900 ft rather than 3,570 mph at 50,000 ft. Apogee was 107,500 ft, rather than 110,000 ft. Maximum temperature was 1850° rather than 700°.

During time of the Kerwin Mission 1.8 W engine was 75 sec at 180% power, Duration of the flight was 15 min.



AERIAL VIEW of Paris air show depicts shows the pattern of the exhibition in the foreground, almost as display in the center and, in the background, the wing of Le Bourget Airport handling regular commercial traffic. Building at right is the main exhibition hall.

V/STOL Proposals Dominate Paris Show

By Cecil Brownlow

Paris-VTOL designs, proposals and politics were dominating factors at this year's Paris International Air Show at Le Bourget Airport.

The show had only one flying VTOL test vehicle on hand, the Short SC 1, but the static displays and technical conferences at the exhibits emphasized European growing interest in a family of V/STOL aircraft.

Companies in France, Germany, Great Britain, Italy and The Netherlands already are drafting proposals to meet current North Atlantic Treaty Organization requirements for a close-support V/STOL fighter capable of a flying distance of 250 mi on deck or maximum specified speed of Mach .92 and equivalent to that to be achieved by NATO on an display here.

England's Bristol Siddeley exhibited its BS 33, predecessor to the larger,

35,000-lb thrust plus BS 100 new engine development as the powerplant for a joint Republic of France proposal for a variable wing, all-weather fighter design capable of sustained on-deck speeds of about Mach 1.25. Powerplant also may be incorporated into a delta on program for the BS 75-powered Flanker P-1127 in which Germans and Britons are co-operating.

Roth-Royce exhibited an engineering

mockup of its RB 145 lightweight, 27,000-lb thrust turbojet that probably will be used in an interim powerplant on a German V/STOL transport under design by Daimler-Benz and the engineering of the RB 162 for which Germans, French and Britons agreed a joint development pact just before the opening of the show.

Like the BS 55 and BS 100, the RB 145 can be used to provide both vertical lift and power for horizontal flight in that the RB 145 which is scheduled to go into a close-support fighter being developed by the German consortium of Messerschmitt, Heinkel and Roll-Royce under government sponsorship.

Rolls, however, is maintaining its philosophy of separate powerplants for lift and horizontal flight, concentrating again on cost, light weight and ease of maintenance. An RB 145 predecessor the 2,100-lb thrust RB 105 used on the Short SC 1, provides lift only and so will the newly advanced RB 162. Rolls also is making substantial progress in improving the thrust-to-weight ratio in its VTOL designs. The 105 has a ratio of 5.1 and the 145 is only slightly better. But the RB 162 is scheduled to attain a ratio of 10.1.

As a third approach, General Electric's display included models drawn around the company's liftless proposal for Mach .92, close-support aircraft under development for the U. S. Navy which GE also would like to market in Europe either as a package, or in the form of technical assistance in a joint project. Power for both lift and horizontal flight is provided by two GE J95 turbojets of 2,100-lb thrust



USAF CONVAIR F-26 supersonic bomber which set a new supersonic turn-rate speed record in a flight from Carswell AFB, Tex., to Le Bourget Airport as a highlight of the 1968 international air show, draws the crowd from the giant Soviet Tu-134 helicopter transport during the exhibition's nine days. Flanked by Maj. William Fure, covered the distance between Carswell and Le Bourget in a total elapsed time of 6 hr. 15 min., along the New York leg by 3 hr. 15 min., 41 sec. Aircraft was refueled twice from a Boeing KC-135 during the flight, at a point just southeast of Newburgh and again off the coast of France and flew 1 hr. 49 min. at Mach 2. The F-26 displayed new American color scheme. Upper portion of the fuselage is painted white with blue striped markings.

each housed concentrically in the fuselage. The lift power from the J95 is directed to a large lift fan in either wing and to a smaller control fan located in the nose section. An air intake in ground, a series of louvers gradually directs the thrust back to the engine inlet and horizontal flight is begun.

Loire-Wall exhibit included a model of a winged pod housing three small lift engines similar to the RB 102 on the forward section of the pod and three on the rear section that will be incorporated into its V/STOL thrust

power design. Pouch located on top and bottom of the pod spring outward to expose engines during ascent and descent and then close to provide a streamlined shape for horizontal flight.

German Design

German Defense Ministry, which is producing a V/STOL transport design primarily to replace the damaged ways for its planned V/STOL fighter, says, says, Loire-Wall and associated firms as a proponent on the project in late May. However, also has been working in Germany on a V/STOL transport design.

That's display featured a schematic of the engine arrangement of its entry into the NATO close-support category, G-38, followed on camera of the G-39 (AW Mag 22, p. 75).

Schematic showed a total of four lift engines located in the fuselage, two located forward and two situated aft, plus two main powerplants also located in the fuselage.

Aside from the various, and especially huggable, political agreements for joint VTOL development projects, no secret interest and anticipated NATO requirements the major issue centers



GENERAL ELECTRIC CO. model demonstrates the company's liftless VTOL, vehicle under development for the U. S. Army. Two J95 turbojet engines located at the fuselage provide power for both vertical lift and horizontal flight.



FULL-SCALE MOCKUP of the Sud 1213 Frelon heavy helicopter, successor to the Frelon 1208 prototype now undergoing flight test trials, can carry a load of 27 troops at a maximum gross weight of 24,250 lb. and a useful load of 11,000 lb. On order by the French Navy and West German Defense Ministry, the 1220 has six power rotor blades compared to four on the 1208. Full rotor blades also have been lengthened and a horizontal tail fin added to aid stability. Powered by three Turomec HEC helicopter powerplants rated at 1,120 hp each, the Frelon has a maximum sea level speed of 130 kt., a cruising speed of 115 kt.



HAWKER-SIDDELEY model represents British space vehicle which would place a 2,000-lb payload into a 500-mi orbit. It represents the use of the British Blue Streak (BSRN) in the first stage, the French Vengeance in the second and in adaptation of the British Skybolt rocket motor in the third. A fourth stage could be added to obtain greater distances and/or heavier payloads.

Administration, included third Stratosphere experimental high-altitude vehicle for supersonic paratroops and its Space Shuttle.

Statutes, which attain speeds of Mach 5 plus, has been fired twice to altitudes of slightly above 50 mi. Third Stratosphere flights at the 70 mi. are scheduled in the final year.

French high-altitude research rockets designed to probe the fringes of space included the Antares and follow-on Boreas.

Boreas, which can attain Mach 17 speeds, also was a payload to approximately 600 mi. in a four-stage launch, just over 400 mi. as a three-stage vehicle. First firing is scheduled before the end of year. Antares, Green four stage version of all S-S-17 has been fired 12 times since 1974. Three stages carry Antares to an altitude of approximately 95 mi. when fourth stage, nose cone, ignites and begins re-entry tests at speeds of about 5,000 mph.

Defense Information Policy Is Clarified

Washington—Defense Secretary Robert S. McNamara has told Defense officials "when in doubt, make disclosure" in clarifying his policy on military information sources.

"It is essential to not disclose information that can be of material assistance to our potential enemies," he said. "It is equally important to avoid overclassification." He also noted that "no secret should mislead or mislead by and to avoid public disclosure of non-essential matters."

Clarifying his most controversial views on information sources, NAVY, May 22, p. 711 McNamara observed that the public information policies of the Defense Department require "delicate accommodation" of competing values. Flow of some information is to be restricted in some respects, but more extensive, responsible disclosure of relevant defense policies and practices is to be encouraged.

Agreement on both sides of important issues must be clear, he said and there will be a commitment of confidence in the ultimate decision. "In a democratic society the public must be kept informed" and has at least a right to know as to what is being done in our name.

He also emphasized that public statements of what appears to be Department of Defense policy must reflect our full policy.

McNamara warned that "in public discussions, all officials of the department should confine themselves to discuss matters. They should particularly

avoid discussion of foreign policy matters." He said this field is reserved for the President and State Department and Defense officials' views could be mistaken as official U.S. policy.

Defense officials whose public speeches have been harshly criticized under the Kennedy Administration complain that they don't know how they can talk about defense without mentioning foreign policy.

Asked about a proposed directive on public information which was circulated among the services in April and which would have centralized military information functions, McNamara stated he knew nothing of the proposed directive, leading to speculation that the proposal was originated without his knowledge.

Nuclear Upper Stages Studied With Saturn

Washington—Performance of the Saturn booster using nuclear upper stages will be studied under on-month contracts by General Dynamics/Johns Hopkins and Lockheed Martin and Space Division.

General Dynamics contract is for \$112,045, and Lockheed's is for \$175,404. Both companies will study second and third nuclear stages based on Saturn I-I and I-II engine clusters in the first stage.

National Aeronautics and Space Administration, which awarded the contracts, also and the 10 flight Saturn C-1 booster development program of firing in late summer will be made with first-stage vehicles rather than three-stage as is planned previously. Stage flights will be made with dummy third stages for stability.

Knowledge Saturn, with a cluster of eight H-1 engines in the S-I booster and on LR-115 engines in S-IV second stage, has a 20,000-lb orbital payload capability, NASA said, and can accommodate the earth-orbiting Apollo command module. Last four flights in the test program will carry Apollo/Saturn Apollo spacecraft payloads.

First three launches will be made with four boosters and dummy upper stages. Next three will be with two first and second stages. With three substantial improvements, these vehicles are about 300 ft high.

Apollo booster tests will be made with two first stages and a dummy second stage attached to the booster. The vehicle is 150 ft high and will be the first test of the H-1 cluster at full thrust. Each engine has a design thrust of 165,000 lb.

The S-V third stage, a cluster of two LR-115 engines, has been deleted from the C-1 flight development program, but NASA said it will be used for some operational C-1 and C-2 configurations.



Golden Year of the Golden Wings

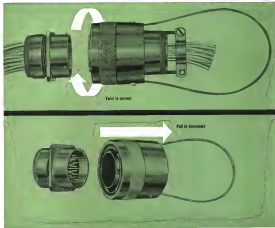
On January 28, 1911, the United States Navy made its first shipboard take-off and landing with an aircraft, using an improvised flight deck on the cruiser USS Pennsylvania. Today, as it observes the 50th anniversary of its own arm, the Navy flies supersonic fighters, swift, jet-powered bombers and attack aircraft, helicopters and other utility airplanes over all the oceans of the world. For the last 30 years, Pratt & Whitney Aircraft engines, from piston to the most modern jet engines, have provided the power for most Navy aircraft. Other current Navy aircraft with Pratt & Whitney Aircraft engines include the Skyraider, Corsair, Cougar and Wildcat.

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McNamara Will Oppose Spending Any Additional SAC Bomber Funds

Washington — Defense Secretary Robert S. McNamara plans to recommend against spending for Fiscal 1962 funds Congress should provide for extending production of Boeing B-52 or Convair F-4B bombers.

McNamara agrees with Congress that the country must be prepared to sustain increased bombers in its operational inventory at least through 1970 and "we have plans to do so. These plans do not require the expenditure of funds in Fiscal 1962," he told a press conference, the second he held since taking office.

Commenting on controversy over the role of the Joint Chiefs of Staff in the abortive rebel invasion of Cuba, McNamara said that the Department of Defense was fully represented over a period of weeks prior to the invasion by him and the Joint Chiefs at their representative.

"As Secretary of Defense I am responsible for the operations of this department, and I am responsible for the actions of all the personnel in the department, both military and civilian," he said. "Any action we take even. They are not to be charged to others."

He stated his confidence in the members of the Joint Chiefs of Staff, calling them "intelligent, experienced, dedicated men." Asked if he expects them to continue their full terms he replied, "I certainly do."

Declining recent reports that there is a seven-month strike in the Pentagon, McNamara said that he meets with the Joint Chiefs at least once a week and several times over a period of weeks. Individually, he has met them hundreds of times and there have been many telephone conversations, he added.

"I think Tim Gatten [Joint Defense Secretary Thomas S. Gates], perhaps more than any other Secretary in recent years, has used the responsibility of close relationship with the chiefs," he said. "I have endeavored to... expand on that relationship, doing it closer and closer together."

McNamara said he believes in an "open door" policy in relationships between the military secretaries of defense and their counterparts in the civilian sector. He also has been free and mutual exchange of information among government departments. He specifically mentioned Secretary of State Dean Rusk, with whom he has discussed such exchange policy shortly after taking office.

Discussing closing of bases, McNamara said that he had divided the

largest 1,000 of the existing 6,700 bases into categories, on functional categories such as territorial training. For each of these 60 systems the department is determining the requirements for the next five years. After these studies are completed, there will be some change announced, he said.

He said that a delay in revealing the locations of 21 overseas bases related only for closing is due to prolonged negotiations with countries involved.

Kennedy Acts to Stop Missile Base Strikes

Washington—Kennedy Administration is moving on no-stride pledges plus a new labor-management compromise to prevent a recurrence of the type of missile base stock stoppages highlighted by the Senate Permanent Investigations Subcommittee.

The subcommittee, headed by Sen. John F. McGowan (D-Ark.), disclosed in recent hearings that 35,572 man-days were lost in industrial strikes by the missile bases between the start of the program in 1958 and May 31, 1961, because of work stoppages (AWM May 22, p. 77).

Secretary of Labor Arthur Goldberg—after conferring with labor, management and modification officials—announced May 26 the "no-strike, no-lockout" pledge, while President Kennedy the same day established the Mutual Labor Labor Cooperation signed to settle disputes at missile bases.

Goldberg and the "managements, contractors, unions and labor unions involved in the nation's missile and space program" had agreed that they "will cooperate in a good understanding of operations and work stoppages of missile and space sites."

Now we have shown that free labor and management are supposed to be responsible for observing the national interest without the cooperation of law? However, Sen. McGowan has promised to introduce corrective labor legislation to supplement the Kennedy Administration action.

The House labor committee will establish labor management cooperation at missile sites to settle disputes before they result in strikes in missile and space departments. He cannot be asked by the committee on the scene, according to Goldberg. After such hearings, the national commission will make recommendations for settlement. The committee's labor and management leaders will be in a

position to exert pressure on the striking parties.

Goldberg and William F. Smith, Federal Mediation and Conciliation Service director, are chairman and vice chairman of the committee.

Public members are David L. Cole, former president of the National Academy of Astronautics, John T. Dunlop, Harvard University economist professor and David H. Stone, astronaut. Industry members include Douglas, Dornier, Martin Co. vice president, Edgar F. Kavan, Kansas Industries president and James D. Marshall, Associated General Contractors of America executive director.

Labor members of the commission include C. J. Haggerty, AFL-CIO Building and Construction Trades Dept. president, George Meany, AFL-CIO president and Walter Reuther, AFL-CIO Industrial Union Dept. president. Goldberg and Haggerty, Meany and Reuther give him a "no strike, no lockout pledge." Often giving the same pledge, some representatives of General Dynamics, Ingersoll Rand, Chrysler and Telegraph Co., The Boeing Co., The Martin Co., Associated General Contractors, Mechanical Contractors Assn., National Constructors Assn. and National Electrical Contractors Assn.

NASA Reverses Stand On Patent Changes

Washington—National Aeronautics and Space Administration has abandoned its long-standing effort to liberalize the patent clause in the space act and now tells Congress it can get along with the present patent policy.

John J. Johnson, NASA general counsel, told a House Science and Astronautics Subcommittee last week "we are not currently experiencing any major difficulties in conducting our industry research of the patent policies" of the space act and therefore the agency is not making revision of the legislation this year.

The space act provides that inventions resulting from NASA contracts become the property of the U.S. government unless the NASA administrator waives the ownership right. The patent clause differs from usual Defense Department policy of demanding royalties from the use of an invention, but not outright ownership.

In 1959 and 1960, NASA sought action on the patent clause on grounds that existing policy discouraged contractors from developing new space space work. A bill to revise the patent provisions passed the House but not the Senate last year.

The Senate Johnson Patents Subcommittee last week, received hearings on the whole patent policy question.

Hebert is Insisting That Defense Tighten Procurement Procedures

By Katherine Johnson

Washington—Rep. Edward Hebert (D-La.), chairman of the House Armed Services Subcommittee on Procurement, will insist that Defense Department establish a special reviewing group to spot-check waste in procurement and put the law of God in connection and controlling offices.

Following a conference with President Kennedy, Hebert anticipated that Secretary of Defense Robert S. McNamara would take action along this line shortly. He said the procedure would be similar to that followed by the Internal Revenue Service with its tax returns.

"Although it might be pointed out that in many instances the IRS spent \$100,000 on administrative salaries to obtain \$2,000 in refunds—the amount of refund that was, actually, in the check, which is miserable," Rep. Hebert told AVIATION WEEK.

Rep. Hebert indicated that the President following testimony in the subcommittee that a General Accounting Office review of 2,770 different waste material procurement price parts—all procured from sole sources and with a

total cost to the government of over \$500 million—showed that "upward of \$30 million" could have been saved had the parts been competitively procured.

Noting that the allegations of waste due to sole-source procurement reported to GAO were "substantiated" by the present Administration, Rep. Hebert said that the President repeated the pledge of full competition he has given members of Congress concerned with Defense waste. At the conclusion of the review, one of McNamara's first moves on taking office was to confer with Rep. Hebert, Sen. Paul Douglas (D-Ill.), Rep. John McCormack (D-Mass.) and other members of Congress, and to reestablish full competition in promoting offices and economy in the Defense Department.

GAO Charges

The Department is scheduled to reply June 21 to GAO's charges that government sole source procurement is a cause of waste, competition is a failure—of unmet replacement price parts in cutting the government's inflation of deficits. The delay, to permit adequate preparation, was requested by Defense Department.



Skybolt ALBM Has New Configuration

Modified configuration of Douglas Skybolt as launchable missile carrier, deployed during second Soviet Dawn observations in Los Angeles, shows removal of actual nuclear warhead from second stage carrier casing (AWC Co. 5 p. 26), and removal of nose cone from the tail and shroud (upper end). Control of Skybolt second stage is now by stabilizing nozzles. Warhead profile will be stabilized for impact purposes in nose section. Modification was made to insure operational compatibility of weapons with USAF's B-57H and British's Avro Vulcan bombers.

In his testimony, Congressman C. Wright Joseph Campbell singled out the specific criticism upon which he based his analysis: quantities of unsolicited parts during a test-at-pass appear again after the system is placed in the field. He criticized the system for failing to utilize technical data and drawings from subcontractors and for failing to utilize the data thus acquired as the basis for competition.

In discussing the possibilities for savings with competition, Campbell cited 12 cases, giving the bid of the former contractor, and the winning bid of the new competitor. The bids in the previous cases were variations between \$114,743 and \$1,000,000. The new contracts totaled \$32,997 to \$92,345 less.

The cases with original contractor and winning bidder were:

- USAF anti-Basing Co. \$1,294 to \$1,011 each. Vols. Ball Corp. \$600, or 38 cents each.
- USAF Motor-Galvan Division, General Motors Corp. \$2,182, or 25 cents each. Detroit Autolite Associates, \$841 or 81 cents each.
- USAF supply—Alcoa Division \$25,091 or \$22.75 each. Associated Aluminum Supply Co. \$10,698, or \$12.92 each.
- USAF machine—Boring, \$7,200 to 45 cents each. Donnan Machine, \$900 or 6 cents each.
- USAF carrier—Gardner—Boring, \$15,698, or \$3.42 each. Ten-Shin Machine and Manufacturing Co. \$2,518 or 92 cents each.
- USAF barrel—Northrup—Lockheed Aircraft Corp. \$2,700 or \$11 each. General Forging Corp., \$2,161 or 88 cents each.
- USAF bolt—Lockheed \$6,210 or \$7.90 each. OH Brothers Machine Co., \$990 or 12 cents each.
- USAF bolt—Lockheed \$41,840, or \$8.15 each. On Brothers \$11,125 or 89 cents each.
- USAF bolt—Boring \$7,892 or \$30 each. Douglas, Vossell Co. \$8,754 or \$8 each.
- New subcommittee—Harrison Steel and Division, United Aircraft Corp. \$3,781 or \$199 each. Koll-Strom Inc. Co. \$2,270, or \$144 each.
- New subcommittee—Harrison Steel, \$1,191, or \$109 each. Koll-Strom, \$2,125, or \$114 each.
- New subcommittee—Harrison Steel, \$1,101, or \$98 each. Koll-Strom, \$27 or \$66 each.

Campbell also pointed out to the subcommittee that price variations from other sources, such as the GAO, have been so great that the government has the option that it can obtain these from subcontractors. He qualified that GAO did not indicate that to evaluate the cost to the government for each source as regarding procuring or packaging the parts.

FCC Asked to Reconsider Limits Set on Commercial Satellite System

Washington—General Electric Co.'s Communications Satellite Inc. has asked the Federal Communications Commission last week to reconsider its recent action limiting ownership and operation of a commercial communications satellite system to existing international communication carriers.

The company asked the FCC to consider as time to permit it to attend the meeting of international carriers which the commission scheduled June 5 to discuss plans and procedures for establishing a commercial space communication system.

FCC is expected to stand by its original decision pending the results of this week's meeting. If a plan can be developed which meets the objectives of some earlier carriers who fear domination by American Telephone & Telegraph Co., FCC is not expected to alter its position. If the meeting demonstrates that the carriers are not aware of their differences, the commission may seek another solution.

The recent FCC action is viewed as curbing the purchase of the AT&T, but the commission's decision contained a very subtle hint that AT&T should seek accommodations with the satellite carriers. FCC said that it had concluded that the formation of a new entity comprising only of satellite is a broad-based common carrier "in the sense of communication and exploration" is an effective means of promoting the orderly development and effectiveness of a space communication system.

The commission's action on excluding non-carriers from ownership does not meet one of the five criteria suggested by the Justice Department in its recent opinion filed with the FCC on the anti-trust implications of a commercial space communication system.

However, the FCC acts to accomplish what it believes are the objectives of the Justice Department. "We feel we see no compelling participation in the acquisition and communication equipment industries will be beneficial or necessary to the establishment of a satellite communication system to be used by the common carrier industry," the FCC said.

"On the other hand, such participation may well result in accumulating the system with complicated and costly corporate relationships, disrupting operational patterns and have been established to the international common carrier industry, and impeding effective operation of the entire and services of the industry," the FCC decided.

The commission says it recognizes

that the desire for ownership participation may be met in other industries. "We believe that without participation the manufacturers of communication equipment will be excluded from the market by the manufacturing companies affiliated with the participating communication carriers."

"Accordingly, it is the commission's intention to require that any new system shall make adequate and effective provision, such as competitive bidding, to ensure that there will be no domination in the procurement of communication equipment."

Satellite Frequencies Proposed by FCC

Washington—Federal Communications Commission has tentatively proposed the allocation 1,775 mc of spectrum, 1,000 kilohertz (2,384 kc) pulsed in a Kanaia 16-Hz, carrying a record set by a Russian M-4 which flew to 24,491 ft.

Avia 745E, a new version of the Hawker Siddeley Hawk transport, is based on the Avia 718 Series T powered by Rolls-Royce K. D7 engines. Time limit is 8 hr 15 min, giving it a range of 2,000 miles and payload capacity is increased to 12,000 lb.

These comments are to be submitted by June 23 and FCC will then plan to send proposed space frequency allocations, including any modifications, to the State Department for discussion with foreign governments. Ultimate goal is allocation recommended for adoption at the 1965 International Telecommunication Union (ITU) conference.

The FCC's present recommended frequency allocations are:

- Satellite-to-earth, 1,600-nc band with, of which 10-nc is to be used for 7,780 mc would be an exclusive assignment while the balance would be shared with fixed and mobile non-terrestrial services.
- Earth-to-satellite, 1,600-nc band with, of which 10-nc is to be used for 7,780 mc would be an exclusive assignment. Remaining 950 mc, of shared frequency, can include 3,925 to 4,425 mc, and 7,780 to 8,150 mc.

• Unassigned—Aerodyne 975 mc in two bands, 4,425 to 7,780 mc and 7,780 to 7,980 mc, shared with mobile and fixed terrestrial services, would be available for fixed assignment for earth-to-satellite or satellite-to-earth services.

• Two-ft weather satellite intended to be in-orbit by late 1965. June 24, but both television channels continue to function.

News Digest

Rolls-Royce is producing a half-sized version of the experimental engine built by B. Naper & Son, which-owned subsidiary of Rolls-Royce. New company will be called Naper Aero Engines. Rolls also has signed in Jay British Aerospace a "substantial" sum in reorganization for Turboprop engines, products which derived from the Vickers Vanguard into BBA service for several months. BBA estimated loss at about \$250 million.

Capital Airlines was merged into United States Lines June 1 when the agreement between the two airlines was filed with the Delaware recorder of deeds, the last step remaining to consummate the merger after the U.S. Court of Appeals rejected city petitions against the Northwest Airlines and Delta Air Lines.

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Manufacturers Institute of Technology has a \$100,000 contract to develop a laboratory model of the Apollo navigation and guidance system for the National Aeronautics and Space Administration.

Boeing Vertol Division has a \$297,000 Army contract for continued development of the Vertol H-19 lifting VTOL aircraft. "Haps" will be made both in separate studies and control during descent, and Vertol will update the vehicle's transmission from 616 to 700 hp and conduct a 50-lb. qualification program.

Federal Aviation Agency light inspection flies in the Embargo 15 into gear for the first time on May 26 for a check of the engine. Light inspection by FAA flight certification tests may be delayed several weeks because of previous cancellations by the agency's flight test program.

Two-ft weather satellite intended to be in-orbit by late 1965. June 24, but both television channels continue to function.



PROPOSED SUPERSONIC medium-range transport, the Super Caravelle, can be built by 1967, according to Sud Aviation President Georges Bessot. Sud will seek funds from the French Civil Aviation Ministry to help finance the development of the aircraft. The plane will fly in the Mach 2.2 region and will have an approximate range of 3,000 mi.

French Introducing Medium-Range STOL

By L. L. Dots

Paris—French aircraft redesigns, in a bid to strengthen its foothold in the transport field in introducing a series of medium-range aircraft with STOL characteristics as a means of filling the gap not covered by foreign competitors. The new aircraft, stemming largely from designs displayed under contract bidding for a military transport, will be offered in both cargo and passenger versions.

An exception is the Potez 940, a 24-passenger transport powered by two 1,700-hp Turbomeca Turmo turboprop engines, which is being built with private funds for delivery in 1961 (AW May 29 p. 21).

Here are the three contenders for the French military contract that was displayed here in model or mockup form at the 24th Salon International de l'Aeronautique last week.

- Breguet 940, light STOL, employing blow-suing or deflated airframe propellers to enable it to take off from a

170-ft run at sea level with gross weight of 22,025 lb. This aircraft appears to be the leading contender for the military contract which will be awarded in September. Commercial version of the 940 is the 940 cargo version and the 942, a varied passenger cargo or 20-passenger pressurized transport with a capacity for up to 55 seats.

- Nord Aviation is making its bid for the military contract with a light cargo version of the Nord-Hispano Vega 800 and 200 turboprop transport. The manufacturer is crossing a commercial

version of the Super Breguet and claims it has received a total of 50 requests for this model. Delivery is planned for as early as January, 1962. The company will begin production of the first 20 commercial models in September.

- Marcel Dassault's entry is the Spécul, 101 to be built by Sud Aviation. With a 5,500-lb payload, operating over a range of 915 mi from a 5,000-ft altitude base under tropical conditions, the Spécul will have a takeoff distance of 560 ft. A prototype now is under construction. Flight tests of the prototype will determine whether the company will enter the transport field with a commercial version.

Back of these medium models will be powered by two Turbomeca Turmo 110 turboprop engines. The Breguet 945 engines, however, will operate both mechanically-connected propellers as a



MODEL of the proposed Sud Aviation Super Caravelle supersonic transport shows wing design configuration. Plans will be developed shortly by Sud Aviation and Marcel Dassault. Propellers to be used on the Super Caravelle have not yet been determined. Right: design under the wing is based under type similar to that on the B-70.

Transports

means of strengthening the deflated airframe principle for short takeoffs.

The two class propellers will be mounted in outer wing nacelles.

The military contract is being offered under a five-year option program which includes construction of 50 light cargo transports required for operations in the French overseas territories. Specific requirements are for STOL aircraft with maximum range of 915 mi, operating at a speed of 220 mph with a 5,000-lb payload. Total cost of this aircraft fleet is estimated at \$35 million.

Meanwhile, Sud Caravelle with a subsonic number of readers affecting to its payload, among other, operations conditions to hold its position as the standard of the French aircraft in distant commercial areas. So far this year, Sud received orders for a total of 10 Mark IV Caravelles. In the U.S.



SPEKUL H, powered by two Turbomeca Turmo turboprop engines, is a military version of Dassault's Commande Interprète (AW Apr. 26, p. 141). The military transport is designed for STOL operations in tropical areas. Model shows blow-suing propellers with wing loading facilities. The nose of the aircraft houses the observer's position. Spécul H will have a 5,500-lb payload when operated over a 915-mi range length. As a medium-range cargo aircraft, the plane can be operated with a 7,700-lb payload over 550 mi, into lengths in a 4,400-ft period over 7-40 mi.



MAX HOLSTE Super Breguet prototype, built by Nord Aviation, was operated in demonstration flights at the Paris Air Show in Rond Air Motor meetings. Delivery of the 20-passenger turboprop transport is planned for January 1962. First production run calls for a total of 20 aircraft.



BREGUET 940 medium-range transport configuration. Designed for STOL, medium-range operations, 940 will be powered by two Turbomeca Turmo 110 turboprop engines. At right is model of Breguet 942, commercial version of the 940 light cargo transport. Breguet will begin production following flight tests with the 940, scheduled to begin with prototype model this month.

TWA is showing strong interest in the airplane and fast track TWA engines and a fleet of eight 50-seat aircraft in close discussions of terms City on operating details and costs.

Although Sud bid a total of 116 Caravelles, it is now understanding plans to request the Caravelle market through a consortium of three new firms. The consortium has been announced in five Mid-VII Caravelles powered by General Electric turbofan engines at its Toulouse plant, will soon move ahead with a version designed for local service as a feeder airline operation. It is also hoped that the French government will support its expensive program in sufficient time to introduce a prototype of the proposed Super Caravelle.

Although an order has been received for the Mid-VII, which is powered by two General Electric turbofan engines, Sud wants to be in a position to promote early delivery since a market for this aircraft has been sought. General Electric flew a series of demonstration flights here during the air show with a turboprop-powered Caravelle purchased from Sud.

For its short range version Caravelle, powered by two Turbomecals, Sud, significantly planned to reflect service and wing span for this model but, because of increasing traffic volumes on short and medium-range routes, has decided to retain the present Caravelle airframe and wing design and power the aircraft with Rolls-Royce Spey turbofans (see p. 99).

Particular interest was centered around Sud's program for a medium-range, regional aircraft displayed here in model form for the first time. The aircraft, which has been under development for some time (AWM May 1 p. 101), will be in the Mid-VII 2 engine aircraft and have a range of 1,000 to 1,200 miles. It is confident that the French government will undertake development of the aircraft and construction of a prototype. A large number of airlines here is, in general, doubtful, but it is felt that the project would not government backing at this time.

There is also some question as to the need for a supersonic transport on medium range routes. Several studies on economic studies on a variety of medium-range routes throughout the world which it feels will lead to it in the type of powerplant necessary to conduct supersonic service on such routes economically and reasonably. The outcome, however, believes these studies will prove not only the possibility of the medium-range supersonic transport but also the need for such an airplane.

It has been noted that Caravelle program to specific market requirements. For example, it is considered that the Jazou Caravelle is required for routes throughout the world that are longer

than the average local service route in the U.S. but have about the same traffic density. The Jazou Caravelle program is planned to be completed.

Sud will start deliveries to United Air Lines, which has ordered 20 Mid-VII Caravelles, this month and will follow with four deliveries per month in the second half of the year. United has set July 14 as the starting date for scheduled service with the Caravelle. A total of 14 airlines have purchased Caravelle aircraft.

The first prototype Breguet 540 was flown here in a series of demonstration flights during the air show and appeared to stand out as the leading contender among French aircraft as an aircraft for short range transport routes. The Breguet 540 prototype will be added in February to United Flight 41 Change which has been named U.S. sales agent for the airplane. One of the aircraft has been set at \$100,000.

The first prototype of the Super Breguet, which has been set at \$150,000, and, placed in the midrange of Royal Air Maroc which has taken an option for five of the aircraft, was also shown in demonstration flights throughout the 1969 air show. Short takeoff and landing characteristics of the high-wing aircraft, which is powered by two Breguet IV turbofan engines each with 936 hp, at least, were impressive during demonstration flights.

Nase noted that the superprototype is extremely high but Nase has undertaken a number of transportation modifications to meet the difficulty. Planned version of the Super Breguet, Model 551, will be produced in 1969.

The passenger cabin is 100-110 ft. 2 in. wide and 11 ft 4 in. high or a cubic volume of 1,295 cu ft—four times that of the Boeing 707. The cabin layout, including baggage and clothes storage space is restricted. The cabin also contains a lavatory with self-stowable galleys, food, baggage compartment is in the tail of the aircraft.

Crewing speed with maximum cruising power is 150 mph. Takeoff ground speed is 985 ft./sec. landing gear distance is 1,000 ft. at 100 mph. Fuel consumption is 1,000 gal./hr. per sec. and at 1,000 ft./sec. per hr.

Maximum stage is 550 mph. Maximum takeoff weight is 21,600 lb., maximum landing weight 20,750 lb. Payload of the freight version is 3,500 lb. and payload of the passenger version is 3,500 lb.

Planned version of the Super Breguet will have a similar freight configuration rather than the stage configuration of the original model. The latter model will accommodate 36 passengers in a stage design of 600 mph. Breguet's competitors have said it will be provided to show baggage space of 120 cu ft.

The Breguet 540 passenger transport and 911 commercial and military cargo transport are the same in design specifications. The aircraft will need payload of 12,500 lb. and will carry as many as 60 men, installed five abreast. Seat back fold down parallel to the floor to serve as a base for cargo load. The aircraft will be equipped with a movable bulkhead permit short cargo-passenger operation.

Powered by four Turbomecals Turbomecals IV turbofan engines, the 540 is equivalent to aircraft design of 675 ft. at sea level with its maximum gross weight of 11,000 lb. Cruise speed is 215 kt.

The prototype 961 was slated for completion last week and flight tests with this model are to be started in the near future. The 961 will go into production when the 961's flight tests have been completed.

The Breguet 961 military support aircraft carries a 3,500 lb. payload over a range of 1,000 mi. at a speed of 215 kt. The aircraft can hold 45 kt. in a turning radius of 200 ft.

The Spauld, developed from the Breguet 415 G-450, will be a 1,000 lb. aircraft with a 1,000 ft. cruise speed and a 915-in. stage length. As a medium range cargo aircraft, the plane can be operated with a 7,700 lb. payload on 560-in. stage length or a 4,500-lb. payload over 740 mi.

CAB Bureau Criticizes Airline Private Clubs

Washington—Restored inter-airline private passenger clubs are being discredited by Civil Aeronautics Board attorneys, who recommended that the carriers either abandon the clubs or bring them under government supervision. Such action would make all such facilities available to the general public.

CAB Bureau of Enforcement attorneys have given the carriers 60 days to inform the board that the clubs are operated on a "customer to membership" basis for the primary benefit of "exclusive" business or governmental travelers. Major airlines included the airlines are to be included in the use of private terminal lounges, check-in facilities, and special treatments, including baggage handling services.

With membership ranging from as little as 1,250 members on some airlines to as many as 70,000 on others, the Bureau of Enforcement attorneys, such clubs violate sections of the Federal Aviation Act which prohibit unreasonable discrimination in the use of the facilities. The increased volume of complaints against these clubs, both from the general public and several airlines, has emphasized the need to remove these practices, CAB Bureau said.

Halaby FAA Reorganization Plan Calls for Deputy Administrators

By David H. Hoffman

Washington—Federal Aviation Agency Administrator N. H. Halaby, who leads the agency less than two months and has few assistants, will make the appointment of three deputy administrators the key change in a broad FAA reorganization now under way.

To perform "key" functions within FAA's headquarters here, Halaby plans to establish three separate departments for administration and personnel, for operations, and for research and development planning. Each of these offices will be headed by a deputy administrator, which will find the "general" administrator.

Under the deputy administrator for operations will be such key agencies as the major FAA bureau, which oversees safety activities by subject matter through the Federal Aviation Administration's Air Traffic Management, Facilities and Instrument and Flight Standards would be transferred to the office of the deputy administrator. Operations would be the office of international coordination and method research.

Alan L. Dean, now assistant administrator for management services, appointed last week to be Halaby's deputy administrator for administration and personnel.

Deputies for operations and for research and development planning had not been selected, but FAA has active recruiting and interviewing potential applicants. Each deputy administrator will have a number of assistants in his office to staff the highest offices by early September.

Designed to decentralize the overall administration of FAA bureaus, Halaby's reorganization plan will contain two other changes of major importance.

• **Formation of five advisory boards** composed of senior agency officials. These boards will be advisory in nature and will exercise no direct control over the deputy administrator.

• **Appointments of assistant administrators** to head the six regional offices of the agency. The assistant administrators would replace the present regional managers, who, despite their title, have only overseeing powers.

Dean Halaby, formerly director of the Bureau of Flight Standards, was named administrator of the Federal Aviation Agency last week in a move that formalized the sweeping reorganization. Halaby's appointment is to direct details of a "transition plan" or pilot program which other reports may

appear in a working model.

Halaby's forthcoming report is expected to call for the virtual duplication of the FAA headquarters structure in each of the agency's six regional offices. Although the agency's Deputy Administrator, Halaby, has been appointed director of the Bureau of Flight Standards.

Halaby's first appointment to one of the advisory boards is Lawrence C. Underhill, director of Region's administrative, or consultation, work. He is being designated by Halaby as executive authority in the regional administration. From there, the chain of command would run directly to the regional administrator for operations, who could find out problems in the appropriate bureau under him.

Hughes TWA Financing Delay Fails

Delayed Hughes' unsuccessful attempt to delay TWA World Airliner 5111 million dollar financing moved the question of TWA's 5111 million to pay 13.5 percent a year to Hughes Tool Co. as addition to last year's 5111 million. Hughes Tool will receive from an annual order of 10.

TWA, which refused to postpone the offering of the 5111 million, is expected to be an underwriting of its obligations to buy up to 5111 million of the debentures, and that TWA lawyers had found no merit in the Hughes claims.

These claims included assertions by Hughes Tool that the 5111 million would be a new controlling TWA, that the majority equity holders appeared to be the financing plan was representing the lenders and not the Hughes stockholders.

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Hughes wanted TWA that it might be a new controlling TWA, that the majority equity holders appeared to be the financing plan was representing the lenders and not the Hughes stockholders.

These days after the May 19 letter, Hughes Tool also alleged to the long-term contract given Charles C. Hughes, Jr., TWA's new president, to purchase 5111 million of the 5111 million stock option. The 5111 million would be a new controlling TWA, that the majority equity holders appeared to be the financing plan was representing the lenders and not the Hughes stockholders.

Finance, public relations, legal and security problems.

The point of FAA claim of some 100 million from field office to request to bureau to administrator, but responsibility lies in the last before request and bureau. A request is being made, for example, against directly to his supervisor in the Bureau of Flight Standards here. Other reports from the same report are intended against the last before request and bureau. A request is being made, for example, against directly to his supervisor in the Bureau of Flight Standards here. Other reports from the same report are intended against the last before request and bureau.

The result, according to Halaby, is four agencies instead of one.

Under the new plan, the agency's administrative, or consultation, work will be designated by Halaby as executive authority in the regional administration.

From there, the chain of command would run directly to the regional administrator for operations, who could find out problems in the appropriate bureau under him.

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Sundstrand e-x-p-a-n-d-s jet start capabilities

— Sundstrand's new Cartridge-Pneumatic Starter has been accepted by USAF for use on B-57H and F-105 aircraft. This new starter, now in production, offers complete self-contained and three-mode starting.

- Cartridge
- Pneumatic start using compressed air from ground power cart
- Cross-bleed start from idling engine

— The new Sundstrand Ramco-Dyne recently approved for the Boeing 727 has been placed in a production line. It combines the two functions of engine starting and transmission of power to a constant frequency 400-cycle a-c electrical generator, in a single lightweight unit. This dual-purpose "power package" offers two more starting modes.

- Electric starting from a single 400-cycle ground power source (which also provides standby power)
- Electric cross starting from an idling engine

— For the ultimate in dispatching reliability, a Cartridge-Pneumatic Starter can be used with the Ramco-Dyne system. This combination offers maximum flexibility and positive starting response under all operating conditions. Includes starting by:

- Pneumatic or electric ground power
- Cross-bleed air
- The Cartridge mode for emergency or complete self-contained starting

— Repertoire of type of aircraft—in, B727, commercial or military, or operating conditions—power equipped fields, adverse terrain, or maximum reliability requirements. Sundstrand has the R&D and facilities for production capabilities to handle your specific starting and cross-bleed drive needs. Write or call your nearest Sundstrand Aviation office for complete information on system evaluation, reliability factors, production scheduling, and initial, operating, and maintenance costs.

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Foreign Lines Automate Atlantic Teletype

By Arnold Shuman

New York—Three foreign jet carriers—KLM, Air France and Lufthansa—have registered for the use of an automatic message communications system which directly connects the U.S. regional district offices of these carriers with their main offices in Europe.

The American Telegraph and Teletype Co./Radio Corp. of America Systems designed AT&T SIRE, is designed to automate the transmission of signal messages overseas concerning the one-to-one manual air-to-air, by providing direct automatic access of typical messages to the own area centers.

Tailored to Needs

The new capacity is particularly helpful after the automatic communications systems utilized by American's scheduled transatlantic carriers—Trans World Airlines and Pan American World Airways both RCA and AT&T are, however that although some form of the automatic transmission are the same, the SIRE is tailored more specifically to the needs of foreign airlines. As examples, the new system includes an automatic message-sequencing system and a polling function capability which expedites the transmission of messages on "hold" status which were added to the needs of the foreign flag lines.

There is a number of operations among the three carriers and AT&T/RCA that the advent of jet equipment, and its corresponding increase in communications, was the prime catalyst in the development of the SIRE system.

In the past, foreign carriers, with outgoing U.S. district offices have been compelled to find information into a New York relay station where the one-to-one messages were manually relayed to their final destination.

The AT&T SIRE system automates the New York hub, instead of sending the messages through an extensive array of long-line circuits in their ultimate destination in the European home office.

Older Systems Saturated

An outgrowth of the AT&T SIRE or Bellco system, SIRE was originally designed to handle domestic teletype requirements, but rapid expansion of airline district offices throughout the country saturated the older system much earlier than AT&T had anticipated.

Also a more sophisticated method of transferring domestic types to and from overseas districts was required in response to RCA spokesman said, fly-by-wire transmission were needed to permit the transmission of



AT&T SIRE equipment, newly installed for the SIRE system, includes console (center) which handles air-to-air messages and a receiving teletype unit on right.

communications on a common type basis while still providing automatic numbering of each individual message. With commission of the SIRE, however, foreign carriers appear to have found a suitable "package" for their communications requirements, according to AT&T spokesman.

The SIRE system incorporates several domestic teletype circuits in the central communications center of the system. A message from Albuquerque, N. M., no longer has to be relayed to a communications center in New York where it must be typed and transmitted again to its final destination. Now the entire message is teletyped to a remote edge center where it is automatically stored until it can be sent on its way via transatlantic lines to the main office. Transmission from a domestic wire station, RCA said, is made by the SIRE polling unit. The frequency of polling each unit may be regulated and controlled by the main station so as to provide greater access to the teletype network for the important or high-priority status.

In terms of lowest carrier transmission, the new system integrates the New York operation, similar to transatlantic communication is concerned, in the role of an automatic relay and control station.

Messages entering the district main console could diverters which select and automatically activate the major printer at the district station. As over-the-airline message must be code

directed, which terminates the connection to a Receiver/Transmitter, RCA said.

Another problem involved by the new equipment is the difference between the domestic signal rate of 75 words per minute and the international signal rate of 60 words per minute. Special devices now enable and compensate for this discrepancy. Also locally received priority messages can be re-sent directly to the national hub by-passing all buffer waiting entrance to the circuit.

Division of Responsibility

Under the new system, AT&T is responsible for the message responsibility. All time line carriers fall under its jurisdiction. RCA enters the picture (as far as the transmission aspect of the communication is concerned). While the primary is essentially in AT&T's domain, RCA has had to modify its equipment to make it compatible with the new system. According to both AT&T and RCA the new system is a "stage."

Advantages deriving from use of the automatic circuit are apparent. Messages are sent more quickly and, since a double typing operation is eliminated, more accurate. This appreciably reduces the present overseas communication delay.

First to have its SIRE system activated was KLM Royal Dutch Airlines. Michael Stages, chief of KLM communications, admitted that the airline "experienced a fair share of bugs in the

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J.B. NEENAN, ASST. DUPT. OF COMMUNICATIONS, PIEDMONT AIRLINES, SAYS...

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circuit during the initial test period," but he added "the system is working as well as perfect as desired again. KLM stands in taking steps to implement the communications system in reverse from Europe to the various district offices in the U.S. although admittedly this is a slow process."

Seven said the AT&T SBR is a more periodic to a computer operation in which messages will travel at the rate of 100,000 words per minute. "Not an I'm aware about this," he said. "We have enough close substantial work now in that direction."

The automatic system connects 43 KLM offices in the U.S. and Canada. "It can certainly be expanded to accommodate more than 100,000 words without difficulty," he said.

Four to order the system, according to AT&T and RCA spokesmen was Air France. Installation delays, however, postponed final commencement of the project until two weeks ago.

Initial Preparation

Two years of preparation and close liaison between AT&T/RCA and Air France communications officials preceded installation. In order to prepare itself for its new communications system, Air France had to modify its original office pattern-making it compatible to the demands of the new network. The airline's communications center in Melsheim was expanded. Air France manager of communications Leonard Brown estimates that the system will cost the airline "about \$400,000 a year." (Air France's total communications budget is \$1 million a year).

"The problem," according to Brown, "was simple how to do in 44 district regional offices with the same office in Paris. Manual systems did not work. They failed and slow. In order to prepare us for the automatic circuit [1982] we needed 17,000 and language telephone circuit which follow a geographical configuration corresponding to regional offices of associated activity. Each regional field office and its associated district offices are connected to their respective language circuits. Codes in letters and numbers permit direct communications between each other and overseas."

In addition to the obvious advantage of expediting messages, Brown said, "the new system will make for a more compact operation here at Melsheim." Air France employs 17 special word processors in its North American communications network.

Brown estimated that 95% of all messages transmitted was the accurate exact pattern in some manner is down to automatic.

Complementing Air France's long-haul circuits is its own operations communications center at Melsheim and Los

Angeles. These military commands in turn, compare closed circuit TV system working, however, accepted of weather maps from the Washington Weather Bureau, a base station VHF for direct liaison with various airport services and monitoring equipment in aircraft communications. Brown said.

Another unusual device complementing the French carrier's new all communications modernization is a monitor control board which permits a supervisor to monitor lines of automatic data, feeding this information when they are in doubt without the relief's assistance of the three-way transaction.

Lufthansa to Follow

Following closely on the heels of Air France and KLM is Lufthansa German Airlines. Ulrich Mueller, communications manager for North America and the airline's representative here of the system has said "I don't know."

"About 50% of our traffic is relayed," he pointed out. "The automatic system into cable channels will be a tremendous benefit from our operation."

Lufthansa expects to connect 38 offices when the system becomes operational.

Sabena Belgian World Airlines is presently under consideration to the SBR system and may become the fourth international carrier to install it.

A new automatic message center with a capacity for handling up to 4,000 messages a day was recently inaugurated at Brussels National Airport. Led by a Sabena official and "the new system doesn't require an increase in the SBR and may tie into it."

Swire and Alitalia have expressed interest in the new system.

The SBR is compatible with the needs of all airlines. AT&T and RCA spokesmen pointed out that each carrier must give the extent of its own communications problems with domestic airline and space requirements.

Air Union Agreement Ratification Prelude

Pan-National centers from five West European nations—Austria, Air France, Sabena and Lufthansa—have completed negotiations and now are negotiating that respective governments to ratify the Air Union agreement which would unite the carriers for better planning and equipment purchases.

Final parliamentary ratification is not expected before the end of this year or early next year and it is possible that portions of the carrier agreements may have to be negotiated due to government intervention (AW July 15, 1980, p. 37).

Licensing Board Ends Hearings On Cunard's North Atlantic Route Bid

London-British Air Transport Licensing Board last week concluded hearings on a controversial plan to put two British carriers on the lucrative North Atlantic route and concluded from the British Parliament. The Board had, under advantage during arguments by Cunard Eagle Airways, Grand Strandair, which has applied for the route, and British Domestic Airways Corp. (longer British-controlled airline, BDMC), had opposed the request on grounds of national defense of traffic at the time of the request (AW May 28, p. 15).

Final grant probably will not be known for some months, although Norman Ashton BML, Cunard Eagle director, stated a plan for an early decision pending to avoid problems associated with starting new service. Cunard Eagle has two Boeing 747s in the airline with an option to third to start July 1981 New York service if the application is approved.

Meanwhile, Cunard Eagle's parent company, Cunard Steamship Ltd., has been in talks with the British Board for approving slower 524 routes for the two Boeing jets while still asking for a substantial subsidy and investment \$50 million, to build a new Queen's pier near Liverpool.

Parliamentary Reluctance

First indication of parliamentary reluctance to approve the ship ferry route, when a member of the Labor Party said in a speech in the North Atlantic Shipping Bill to cut the total amount by \$14 million, the amount spent for the jets. Some Labor Party members contend that the two jets would require BDMC's change that another British carrier on the North Atlantic route would be "wasteful duplication" of service.

If Cunard gets approval of the application, it would start London-New York service in 1981, with three three-hour weekly runs in March, and along the Boeing jet. Both sides have the right to appeal to Ministers of Aviation Peter Thorneycroft.

British United VC-10s

London-British United Airways last week ordered four Vickers VC-10 long range jet transports for use on existing routes to London, Milan, Athens and the possible use on an unopened route to Athens and the Far East.

VC-10s, worth \$25 million, replaces British United's previous of 30 BAC 111 short-range jet transports for \$25 million (AW May 15, p. 42). The VC-10s will be delivered in 1981.

Hearings on British United's route request will start before the Air Transport Licensing Board June 21 and are expected to finish by August. However, British officials noted, in the second stage of a battle between the British independent and the nationalized airlines (AW May 22, p. 15).

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Along with its water landing capability and various module versatility the 40 offers the reliability of twin turbine power. All in all, it is one of the most heavily and legibly used aircraft available to the Armed Forces.

BY SCOTT

[illegible]

Next available:

¹⁷ These results indicate that managers do not use the same strategy

² <http://www.merck.com/pubs/medwatch/2003/june/wa20030601a.htm>

* *Ph. maculipes*

² *D. mellipes* (Linn.) and[†] Includes summer long grass.

1998

Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board

AIRLINE OBSERVER

►Rena has been diverted by Portugal in its latest attempt to gain an air link with Cuba. A proposal from Cae/Industria Aeronautica C&A, to operate from Ponta da Herva, using Cubana aircraft and Czech crews, was blocked when Portugal refused landing rights at Lisbon or the Azores. Meanwhile, Newcom continues to ship a steady flow of propylene materials through Europe to Havana as standard air freight commitments.

►U.S. bilateral negotiations are placing increased emphasis on traffic equality provisions as talks with foreign governments seeking new routes. Japan, which began bilateral talks last week, will face a tough bargaining position as the point in its demands for entry into New York from San Francisco. Recent bilateral negotiations with India were aborted after the U.S. refused to expand Air-India's flight frequency into New York from five to seven weekly flights as proposals that Air-India International is carrying 7000 Fido Freedom traffic into this country.

►Major trunk airlines have accelerated their efforts to acquire District Manufacturing Equipment in line with recent Federal Aviation Agency rule proposal. Eastern, Delta, Northeast, Pan American, Trans World, United and Pacific Southwest Airlines have announced recent DME orders totaling \$2.8 million from the Collins Radio Co.

►United Arab Airlines' interest in acquiring U.S. built turbojet transports is being studied by manufacturer's attempts to find methods of making aerial traffic in financing orders. The carrier may lose this job as a result of a visit from Boeing, Douglas and Convair, and one more before a decision is made. It has been proposed that Egyptian traffic be sold through Swiss banks to help the United Arab Republic finance the purchase of new aircraft.

►Turkish equipment, which now comprises 77% of the total world fleet of J&L aircraft, produced 30% of the airline industry's production output in 1960. International Civil Aviation Organization reports that turbojet transports, representing 34.4% of the fleet, provide 30% of its capacity.

►Japan Air Lines board has authorized purchase of additional DC-8s. Long-range turbojet equipment would suit JAL, and Douglas is seeking sale of new aircraft. However, JAL's line of use of its DC-8s as a trading vessel, accident at Tokyo in 1960 is causing the airline to look for possible quick delivery opportunities, purchase from Northwest Airlines being the most likely. National Airlines might be another source, since it has an option under certain conditions to trade in its Series 20 turbojet DC-8s to the Boeing Series 50 DC-8s it has on order, but the trade in is unlikely to be for a year or more. JAL has an option on one turboengine DC-8.

►Aeroflot, the Soviet airline, is expanding its eastern travel flights five years, with preliminary negotiations in the Caracas-Bahia San Paulo route. Aeroflot Airport, a departure point for each of the new, will have 20 turbojet flights and Aeroflot daily round trips during the summer from widely scattered points.

►Western Air Lines and the International Air of Michigan have signed a policy contract concerning maintenance personnel from April 1, 1963 to May 31, 1965 and providing two-day pay increases ranging from \$25 to \$40 a month.

►San Antonio plans to manufacture five Mark VII Casatiles for exportation. Powered by General Electric turbojet engines, the Mark VII is expected to be completed this month, with first delivery planned next February.

►San Francisco & Oakland Elmhurst Airlines began its first daily service last week making stops at the two cities with scheduled flights. Two Sunday 5:03 AM turbojet flights carrying a frequency pattern of 10 daily flights between 6:30 a.m. and 10:00 p.m. Present schedule is to be doubled June 15.

SHORTLINES

►All-England Airlines has submitted a 10% discount for cargo shipments between 993 and 1,800 lb and a 20% discount for shipments over 1,800 lb. The carrier also cited the maximum weight limit per cargo piece from 140 to 300 lb to expedite cargo service.

►British West Indian Airlines reports it carried 226,668 passengers 100.7 million revenue passenger miles during 1962, increases of 15% and 14% respectively over 1959.

►Delta Air Lines has Civil Aviation Board permission to suspend service, between Chicago and Ft. Lauderdale, Fla., until December after determining that May-November seasonal low traffic would not meet the breakdown need for the route.

►Federal Aviation Agency has launched Project Pipeline, a carrier program which includes a study of aircraft supply problems and development of future supply systems likely to demand.

►Flying Tiger Line reports \$20.5 million operating revenues and a net income of \$42,356 for the nine months ending May 31, 1961, compared with \$19.5 million operating revenues and a net loss of \$625,688 for the same period last year.

►KLM Royal Dutch Airlines has begun DC-8 service from New York to Rome, London, with two weekly flights and to Glasgow, Scotland, with five flights per week.

►Pacific Air Lines reports its operating profit of \$113,135 for the first quarter of 1961.

►Pakistan International Airlines has received a license to serve period as a charter carrier between Karachi, Pakistan, and New York via points in England, West Germany, Switzerland, Italy, Turkey, and ultimate points in Lebanon, Egypt, Iran and Saudi Arabia.

►Perings last Civil Aviation Board permission to continue suspension of service to Oaxaca, Oaxaca, San Ignacio, San Jose, Nelson, and Puerto Suarez, Bolivia until June 1, 1963. The carrier has suspended its DC-8s, the only feasible aircraft to serve these points.

►Vina, newly-formed Venezuelan airline, has assumed Francisco Kennedy's approval to take over the routes to the foreign or cruise permits of Venezuela L&V and Aerov.



PROGRESS IN MICROWAVES

New General Electric VTM's and TWT's . . .

ADVANCE S- AND X-BAND TRANSMITTER CAPABILITIES

Provide Higher Power in Lighter, Smaller Tubes

Four new General Electric power tubes—two voltage-tunable magnetrons and two traveling-wave tubes—have been designed to advance transmitter capabilities in S- and X-bands. All provide higher power in smaller, lighter, more compact packages for missile and airborne transmitter applications.

HIGH EFFICIENCY, LIGHT WEIGHT VTM's

Designed primarily for space applications, the Z-5428 voltage-tunable magnetron achieves an efficiency of 38 percent in a tube weighing only 4.5 pounds. Moreover, it operates under severe shock and vibration conditions with only radiation coating. Tests show the Z-5428 meets shock requirements of 40 G's for 11 milliseconds and vibration requirements of 5 to 20 cps at one quarter-inch double amplitude, and from 20 to 2000 cycles at 10 G's.

Equally efficient and compact, the Z-5428 provides high power (30 W min.) in an exceptionally light (4.5 pounds) VTM. And like the Z-5428, it is a complete r.f. power package requiring only input and r.f. output power connections.

Both VTM's can be linearly voltage-tuned without mechanical adjustment.

HIGH-POWER, COMPACT TWT's

The two new high-power traveling-wave tubes are designed to

operate in series, one as the driver and one as the final amplifier in a pulsed high-power chain for X-band radar applications. They are compact, of metal-ceramic construction, and incorporate an advanced focusing system, utilizing periodic permanent magnets providing no lens-potential stabilization. The Z-3990 driver tube weighs only 15 pounds while the Z-3000 amplifier tube weighs 40 pounds with electron components. Both tubes are ruggedized for airborne applications and can be mounted in any position.

These TWT's, as well as the new VTM's, are now available in sample quantities. Delivery is 90 to 120 days.

FREQUENCY RANGES AVAILABLE*		
VTM's OSCILLATOR SERVICE		
Frequency (Mc)	λ_c (inches)	P _{avg} (W)
2.5 - 2.5	10 W	
2.5 - 2.5	10 W	
2.5 - 2.5	10 W	
2.5 - 2.5	10 W	
TWT's AMPLIFIER SERVICE		
Frequency (Mc)	λ_c (inches)	P _{avg} (W)
2.5 - 2.5	30 KW	
2.5 - 2.5	3 KW	
2.5 - 2.5	30 KW	
2.5 - 2.5	30 KW	

*Other tubes can be used to meet specific frequency and power requirements.



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Z-5428: Designed for space—
3000 to 2200 mc.



Z-3990: Perfectly processed through
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T-39 Sabreliner leaves down test flight over Palmdale, Calif. Pilot can be seen by one pilot, as all flight controls and instruments are accessible from both seats. Canopy panel is fully instrumented for integrated and instrument proficiency training.

Aviation Week Pilot Report:

Sabreliner Shows Fighter-Like Handling,

By William S. Reed

Edwards AFB, Calif.—North American's T-39A Sabreliner is comparable in size and weight to the F-46 and, with the exception of a lower maximum Mach number, performance of the new trainer/bomber design jet aircraft is very much like the performance of the Sabre fighter.

Maneuver control, particularly in responsiveness and lightness of the four quadrant in deflection, in the same category as the F-46.

Outstanding Features

During a recent 2 to 40 sec. flight by the San Antonio Wings pilot, aside from the aforementioned fighter-like handling and performance characteristics, three additional features left an impression.

- **Ground handling** is surprising in the absence of hydraulic main wheel steering operated in conjunction with the rudder pedals. A button on the control wheel engages the hydraulic steering. It incorporates a holding relay, a feature test pilots have been asking for several years, whereby one push engages the system, a second push disengages it. Four inches of the pilot's hands thus is assured during two op-

erations because the button does not have to be held down.

- **Emergency descent** from emergency operating altitude is accomplished with great regularity. From a cruising altitude of 48,500 ft., descent was made to 15,000 ft. in 2 sec. 40 sec. with safe power, speed broke out. A floor angle of approximately 30 deg. is achieved during descent at normal operating Mach V₀.

- **Emergency procedure** and system operations are simple because the aircraft uses state-of-the-art developments. Electrical system uses d.c. generation on both engines with alternators for a.c. power. Nickel-cadmium batteries are used for ground start and emergency d.c. power and to operate flaps and trim. Control system is all mechanical, therefore not affected by hydraulic or electric failure. Landing gear extends by gravity and synchronous pressure with accumulator pressure available for speed brake extension.

A strong, gross suction wind prevailed at the time of Edwards. West's flight in the standard five T-39A with Air Force project pilot Capt. F. D. Rowland. A quieting headwind on the ground measuring 18-20 kt. with gusts to 30 kt. threatened to cancel the flight but by cutting the preflight de-

mission short the aircraft was put into the air before the winds forced cancellation.

T-39 Cockpit

The Sabreliner cockpit is laid out for single pilot operation. All instruments and controls are within the pilot's line of sight, convenient to the pilot on the left seat. Flight instruments are duplicated in the right seat for pilot training. Starting engine on the Sabreliner is a simple matter: starter button is depressed, which accelerates the engine to 10% rpm; through the starter generator. Either internal or external power may be used. At 10%, throttle is opened to idle, increasing the rpm and commencing fuel flow.

Engine starts, the button pops out at about 51% rpm and the engine accelerates to its full speed of about 12% rpm. Procedure is repeated for the other engine.

A slight increase in power is necessary to get the aircraft rolling after which full power is sufficient to attain a normal take-off speed. Despite this, however, the fusion bond of the main gear prevented no problem during ground operation and the aircraft landed less than anticipated. Visibility is good, brake control positive



CURRENTLY being flown with four passenger seats built on under wing in place and installation of six passenger seats. Cabin pressure 8,000 ft., pressure altitude to 45,000 ft., and 8.5 ps. differential above first altitude. Tapered-shaped windows limit passenger visibility.

Performance

and nose wheel steering provides good control.

Takeoff gross weight of the Sabreliner for this flight was 17,100 lb., including 7,000 lb. of fuel and six persons. Maximum permissible gross weight is 17,760 lb., including provision for two extra seats in the cabin. Plus a for the aircraft to weigh 5,500 lb. empty, minus 7,000 lb. of fuel and carry eight persons or 1,500 lb. of cargo for 1,500 m.

Determination of engine setting in engine indicator, thrust is accomplished by a rather involved procedure involving exhaust total pressure P₂. Since the engine fuel control does not compensate for inlet temperature, the pilot must determine ambient temperature and pressure and then consult a chart or computer to determine P₂ required in inches of mercury. According to the project P₂ could result in according the pressure laws on the compressor or intake and right contribute to diminished engine life or possible failure. The same computation must be completed at each 5,000-ft. interval on descent and is a considerable burden on the pilot, especially during instrument operations. This at present is a matter of economy, the Air Force test, percent exhaust pressure

into measuring devices are considered too expensive. Discussions are under way regarding installation of a more suitable thrust measuring device which will require less pilot attention. P₂ on this particular day was 57.5 in. Hg.

Directional Control

Directional control, even in the existing strong command at Edwards, presented no problem on takeoff. Control is maintained by nose wheel steering and aileron effectiveness is obtained at 60 kt. Roll rate is varied at 10% and the T-39 lifted off at about 120 kt. The same nose-light sensitivity experienced on F-36 is noted in the T-39 as the aircraft comes back and lower ground effect. Slight viewing of back pressure on the elevator is necessary in the elevator before the downwash produced by ground effect. Landing gear is retracted when definitely above, with flap retraction across phased before, upward roughly 160 ft.

The aircraft accelerated rapidly to four climb speed of about 250 kt. and passed through 5,000 ft., indicating a rate of climb of about 3,500 ft./min. Over-the-nose visibility suffers somewhat in the climb as it does in most aircraft but not to a critical extent. Visibility is enhanced considerably by the "periscope" windows which also expand and sideward visibility especially in turns.

The T-39 passed through 20,000 ft.

61 min after brake release from Edwards, climbed through 35,000 ft. in 11 min and reached 55,000 ft. in 15 min from takeoff. From a climbing Mach number of .52, reaching Mach of .75 was reached in level flight one min after leveling off.

Setting up for cruise at 55,000 ft., had been registered 1,250 ft./hr., rpm 97% and fuel quantity indicators showed about 5,600 lb. of fuel remaining. By continuing at this cruise setting and altitude, the Sabreliner could have flown 1,310 more mi., in addition to the 90 mi. covered in the climb, or 1,240 mi. with a 30 min reserve at altitude. Its climbing immediately to an initial altitude of 51,000 ft. and cruising to 55,000 ft., 1,500 more mi. could have been covered in 3 to 10 min, with a 40 min. reserve.

Indicated speed was about 245 kt. at this altitude, pending an adequate margin of engine/prop speed until the onset of stall building. Control in all three axes was positive and stable with a little more than a normal amount of elevator force required to maintain it. A slightly high elevator force gradient in all maneuvers is required in the T-39.

Later, the aircraft was climbed to 45,000 ft. and here the indicated speed dropped to about 238 kt. at Mach .76. The aerodynamically-squared leading edge slots began to extend whenever the bank angle approached more than



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30 deg but their extension is equal to with wings. Considering the altitude, measuring wings is very high in this aircraft. Cabo Airde was monitored automatically at 1,000 ft to 45,000 ft, descent in 3.5 per differential is maintained. Bleeding and pressure loss was anticipated and the engine noise level was not excessive. Considerable noise is generated by the air conditioning system in this model but this has been reduced to a much lower level in models now coming off the line, North American says.

Simulated Emergency

Emergency descent was initiated from 45,000 ft while cruising at Mach .75. Throttles were retarded to idle, speed brake extended and winged held at 76. Floor escape becomes rather steep (about 30 deg) and descent to 15,000 ft took 2 min. 45 sec. Although a hypersonic speed brake is located beneath the fuselage, in a manner similar to the F-100 series, little time change accompanies its deployment and buffeting is minimal.

High "G" as in landing approach. Mach of .70 or so 135 ft/sec is used with constant handling qualities noted. Turn change with increasing speed was gradual, indicating positive speed stability until the Mach .70 approach. At this point the wind tunnel data is usually fairly accurate but aerodynamic pitching becomes greater as the Mach number approaches .85. Resulting rise, requiring considerable trim change, shows that good, hence the fairly low Mach number to which the aircraft will be limited. Never exceed speed, Mach .85 and above this, indications are that the trim change is great.

Stall was conducted at the clean and landing configurations below 15,000 ft, the maximum altitude for stalling at the present time. Stall restriction probably will be raised to 25,000 ft soon after present tests indicate some progress in the post-stall engine bleed-off problem. North American and Pratt & Whitney both are working on the problem of post-stall engine bleed-off at altitude caused by a reverse air flow at the inlet making an induced flow less than as revealed in test studies. Test studies have been tried in wind tunnel ground changes. Inlet changes have resulted in raising the stall altitude but have not completely solved the problem.

Question as to whether the aircraft should be stalled above 25,000 ft is debatable. Air Force says the aircraft must have the capability in order to prevent some hostile pilot from being back engines if he inadvertently stalls trying to top a threshold.

Stall characteristics are very good in both clean and landing configurations.

T-39 Basic Data

Wing area	141.91 sq ft
Wing tip	40.34 sq ft
Wing ribs	36.34 sq ft
Wing sweep	26 deg
Horizontal tail	77.80 sq ft
Vertical tail	41.50 sq ft
Fuselage area	79.90 sq ft
Stitch	79.90 sq ft
Design loading weight	
Normal	11,000 lb at 30 kg
Maximum	17,700 lb at 6.6 kg
Maximum load factor (normal)	10
Power margin (g)	+4.0
	-3.0
Extended range (g)	+1.5
	-1.0
Powerplant	(2) F4W 100F-5
Weight (lb)	479 lb
Katons	
Military (SL) 10 min	3,000 lb
Normal (SL) 10 min	2,400 lb
Class weight	
Normal weight	16,700 lb
Extended range	17,700 lb
Fuel	
Normal range	895 gal
Extended range	1,395 gal

Class, the aircraft supplies ample warning of impending stall. Buffet begins in about 15 ft with (slightly increasing) at the stall approaches. Control, particularly ailerons, remains good through the post-stall region. At a weight of 11,000 lb, the aircraft stalls at about 95 ft. Lowering the flaps and gear allowed the stalling speed to 90 ft with control remaining equally good. Thus, over which the pilot extracts no reaction to control at about 150 ft at 15. Extension is even and no wing stall occurs.

Engine acceleration from idle to full power at 15,000 ft took 4 sec, an excellent response time. Also, at 15,000 ft, one engine was held at idle while the remaining one was advanced to maximum continuous power, 87% rpm. Very little trouble regarding engine control was noted in stall attitude at low and level. The aircraft accelerated from 110 ft to 210 ft very handily, bearing out the single engine performance statistics which indicate that the T-39 could climb from sea level to 20,000 ft in 30 sec at one engine. Single engine service ceiling is listed at 30,000 ft.

Landing pattern was entered at about 160 ft with the speed brake extended and the aircraft in a descent attitude. Speed brake was held down through out the pattern because it has very little effect on stalling speed. Normally it is retracted once the downward leg speed of 145 to 120 ft, is reached and the

gear lowered. Flaps are extended at 140 ft with wings extended to 120 ft on low leg. Considerable nose-down trim change is experienced with flap extension and North American installed a pitch trim compensator which automatically adjusts elevator position at the flap lever, making trim change less apparent to the pilot. Air Force, however, elected to eliminate this feature and trim now must be applied to the elevator simultaneously with flap extension. This is not difficult and a condition entry is more accepted aircraft.

Once the pilot knows the trim change is coming, he can apply trim in flaps or ailerons. Rate of trim change is about equal to the rate at which the stabilizer is moved by the trim system and holding force on the control yoke is virtually eliminated once the trim change is anticipated.

Approach Procedure

Approach is set up at 115 ft and a power-off descent can be conducted once the aircraft does not have high rate rate deceleration. Touchdown occurs at 8,000 ft in a nose high attitude not appreciated until the nose wheel is lowered. The nose can be held off but it is generally allowed to contact the ground shortly after the main gear touches for improved stability and better ground handling. As speed decreases, nose wheel steering is engaged. With evidence linking, the Schweizer was brought to a stop in less than 1,000 ft.

A total of 98 Schweizer has been ordered by the Air Force, as of which are the T-39 configuration and its training aircraft for the Air Force-developed North American Search and Rescue (SAR) Four of the T-39 models have been delivered to Nellis AFB, Nev., where they are being used to train Republic F-105 pilots in operations of the NASAR entry (AW 10, 10, 10). The remaining 93 Schweizers will be in the configuration flown by Air Force Wing for this report.

So far, no definite follow-on aircraft has been planned for the search and rescue role. The Air Force will increase the number of NASAR equipped by its training programs developed. Eventually the aircraft will be used for the F-105, making further use for the NASAR training.

Commercial certification of the Schweizer is being entered by the North American with an eye to offering the aircraft as an executive transport. The company's commercial Schweizer Bold air has been taken for private delivery. Price of the Schweizer, without accessories is about \$750,000.



As a result of development by the Magnavox Company in conjunction with the Navy Department, every Chance Vought F-4C Phantom II Fighter Pilot sees the target at a glance—day or night, in any kind of weather.

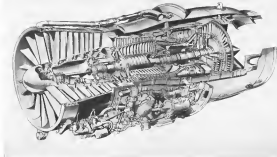
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AIRBORNE FIRE CONTROL RADAR



SPEY CUTAWAY shows four-stage low-pressure compressor and variable stator stage and expansion of 10-stage high-pressure compressor. Two flame tubes are in the combustor combustion. Five Spey engines are undergoing static tests at sea level conditions.

Spey Features Mechanical Improvements

London—First details of the design of the Rolls-Royce Spey (RB 161) turbofan engine show new mechanical features to four units.

- **Fuel control system** is ultra-mechanical to improve reliability. Earlier units used pressure-responsive systems with electro-mechanical linkages.
- **Low-pressure compressor** is shell construction instead of the solid disk-plate design usually employed.
- **High-pressure compressor** has variable stator vanes at the inlet.
- **Exhaust** air-coupled exhaust system is a new approach featuring radial inlet ducts leading from the bypass stream into the exhaust stream to get a lower exhaust velocity from improved mixing.

Current Testing

Two Spey engines are currently running in static tests at sea-level conditions. Altitude testing is scheduled to start soon. A complete Spey powerplant is scheduled for current static testing in a cell with thrust reverser and noise suppressor built to production standards of the de Havilland Trident three-quarter transport.

Flight tests will start in August with two Speys mounted in an Aero Velox testbed, and Trident ground

WHS at beyond duct. Spey engine (right) is at an advanced stage of assembly in the experimental shop.



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ROLLS-ROYCE Spee turbo engine at 318 in. long, 30 in. in diameter.

and flight tests are planned for this winter.

Total of 14 complete engines will be used in static testing of the Spee in an integrated development program for both civil and military variants. Additional engines will be used in flight and endurance test work.

The Spee carries a constant power hot water thrust rating of 9,650 lb. The engine has been selected for the British Aerospace Conquest 311 short haul transport in addition to the Trident. The military contract is for development and construction of a number of prototype engines, presently scheduled for the Blackburn NV 19 low-level strike aircraft for the Royal Navy. Spee design data leads to the company's experience with the RB 141 turbo engine planned for the original Light 515 Trident. The RB 141, rated at a design thrust of 11,000 lb., was in two years based on the Conquest experience in that powerplant is also part of the Spee.

Spee development engines were produced under the RB 341 program, and have been accumulating test data since they first ran in November 1959. Rolls says that development experience on the RB 141 has been directly applicable to the Spee, in its thrust, in the Spee work.

One example of the RB 141 tests included simulation of the compressor inlet loss conditions when the Trident engine-cage air intake is shut. With this background, Rolls-Royce engineers could go directly to tests of the Spee fitted with complete outer duct and inlet cone of the Trident.

Current engine tests in all five development Spee engines, total about 718 hr. of which about half is on one engine used for endurance running and which has completed a 64-hr. test.

Design work on the Spee began in September, 1959, and the first engine ran at 80% and of December 1960. Cor-

rent engine is designated RB 161 J, it has a guaranteed takeoff rating of 9,510 lb. maximum sea level static thrust. Pressure ratio is 17.1. Dry weight, fuel consumption is 3,766 lb./hr./lb. at 25,000 ft. and Mach 0.78. The engine weighs 2,295 lb. dry, is 118 in. long from intake face to exhaust cone flange, and has a maximum diameter of 37 in. Production engines are scheduled for late next year.

Next in the series is the RB 161 Z, which will be rated at 10,410 lb. sea level static thrust due to greater refinement in the design. It will enter production in 1965.

Spee, RB 141 and Conquest all use the basic Rolls-Royce turbo concept, in which all of the intake air passes through the low-pressure compressor before flowing to pass through or around the rest of the engine. In the case of the Spee, the flow ratio is such that it, equal parts of the unheated air pass through and around the engine.

Rolls claims this ratio is an optimum for its turbo engines. The comparison has advantages of its design, primarily over that of turbofans, intermediate which Rolls rejects.

Single air inlet and nozzle for both low-pressure compressor and high-pressure compressor designs of both recent and older.

Pressing hot and cold flows before expansion through a single nozzle in power plants, allows about 50% more thrust with same weight.

Rolls says optimum Spee takeoff rating is between 9.5 and 10.5, at cruise engine temperature of 1,150K (approximately 1,600°F) with the air cooled turbine blading which characterizes the company's trend toward gas and turbo-prop engines. This range is not required by all engine manufacturers, at optimum their literature shows a wider span of variation depending on the company and the engine application suggested.

The challenge of aerospace



This view from the cockpit of an aerospace craft suggests the next great frontier for airlines. Space, darting through the fringes of space, the U. S.

Air Force Dyna Soar and the X-15 will pave the way for even more advanced manned vehicles.

Westinghouse has already made major contributions to the Air Force's first forays into space. The highly successful stabilization system for the X-15, for instance, was designed and built by Westinghouse, and the Westinghouse Aerospace Electrical Department is a prime source for electrical power generating systems for manned hypersonic vehicles. Westinghouse is a major contributor to aerospace in defense—now devotes a large percentage of its more than \$200-million yearly R. & D. program to an all-out research effort for breakthroughs in this critical area. These four pages describe some of the military systems headed for the skies of tomorrow.

Westinghouse



aerospace guardians of freedom

Symbolized in this artist's conception are the four vital orbital missions in the aerospace defense picture of tomorrow: 1. **ALERT:** satellites capable of detecting missile launchings by sensing the heat radiating from rocket exhaust flames. Such a system will increase the 15-minute early warning presently available to nearly a half hour. 2. **OBSERVATION:** global observation satellites will gaze down from the aerospace ramparts. Together with the alerts systems in orbit, they will provide the U. S. with warning of impending attack. 3. **DEFENSE:** counter-missile systems in orbit, and other weapon systems in this class hold the promise of neutralizing ICBM attacks by striking down missiles while they are still far from their targets. 4. **SCOUTING:** Finally,

several systems capable of rendezvous with satellites are now under study. Vehicles in this class will "look over" unidentified objects in orbit for positive identification. Among the 60 divisions of Westinghouse, outstanding contributions to advanced aerospace systems are: the Westinghouse Aerospace Electrical Department - the Westinghouse Astronautics Laboratory - the Westinghouse Air Arm Division - the Westinghouse Electronics

Division - the Westinghouse Aerospace Electronics Laboratory - the Westinghouse Central Research Laboratories. Contributions from these key sources include: Nuclear propulsion; IR, UV, and low-light level imaging systems; space stabilization systems; guidance systems; computers; satellite tracking systems; inflatable structures and radar antennas; molecular electronic systems; space electrical power generating systems; spacecraft support equipment — and new levels of effectiveness and reliability in each area.

Westinghouse



Westinghouse's future... (text partially obscured)

aerospace power for peace

Westinghouse... (text partially obscured)



Westinghouse



RYAN'S ROGALLO WING airplane consists of four wheeled open frame body with high central pylons hanging braced offset delta wing.

Rogallo Wing Studied for Combat Mission

By Russell Hewkes

San Diego, Calif.—Ryan Aeronautical Co. has begun flight tests of an experimental Rogallo wing (AW Sept. 19, 1960, p. 57) airplane... (text continues)

Army aviation authorities hope the reconfigurable vehicle can be developed into a light, inexpensive, easy-to-operate aircraft for numerous battlefield roles... (text continues)

Mc Donnell Douglas of NASA and has been investigated in wind tunnel and in... (text continues)

WING FABRIC is Nylon bonded to nylon. Plane is powered by a 100-hp Continental piston engine (AW May 29, p. 38)





PHOTO of No. 16 Squadron, on 10 min. alert, lead for their jobs as at dawn. Note Frenchman mounted under wing.

British Test Air Defense Against Simulated

By Herbert J. Coleman

London—Britain's air defense forces sustained a working series of attacks, less involving aircraft carrying simulated nuclear weapons in an exercise involving Victor bombers (Operation Mocking), Bloodhound air defense missile area and the Royal Air Force's Fighter Command (Operation Mustang).

In the simulated period during which pilots were early stood down for more than a few hours. Fighter Command flew hundreds of sorties, less persistent, and dispersed into, intercepting a simulated force of bombers and fighters from NATO bases in Germany and France.

The exercise also included the Royal Observer Corps' search in the field of nuclear fallout reporting and damage control.

In a determined effort aimed toward realism, each military station assumed readiness for nuclear attack and reacted to bomb damage and fallout as expected during an actual attack.

Prima, responsibility for air defense fell to Fighter Command, and the RAF used English Electric P1 Lightnings, Gloster Javelins and Blackburn Hawks in aerial attacks. Major airborne weapons was the de Havilland Firestreak air-to-air missile, plus 30 mm. Army cannons mounted on the Lightnings and Javelins.

Three targets were Victor and Vulcan

bombers of RAF's Bomber Command, and a unit of NATO aircraft that included RAF Canberra, North American F-100s, McDonnell F-101s and Convair F-102s of 17th Air Force Royal Canadian Air Force Avro CF-100s, and French Sud. 4016 Vautour heavy jet tactical support planes. These planes were not used as fighters, instead they simulated tactics actually used by light bombers.

In the initial phase, the combined exercises, the V-bombers reacted to a threat of attack by dispersing to various satellite airfields. RAF has never revealed the number of V-bombers now operational, but there are somewhere near 100 now in line days. The period, they probably were based at up to 40 different airfields some of which had runways no longer than 6,000 ft.

After the first phase, the V-bombers turned into aggressive forces and, joined by the NATO airplanes, made the first attempt to penetrate the United Kingdom defenses, entering an area from the North Sea at extremely high altitudes, an excess of 45,000 ft.

To watch Fighter Command in action, the Aviation Week editor went to Wattenham RAF Station near Shoreham, Sussex, one of the famed Battle of Britain fighter bases which was heavily bombed during 1940. A few small pillboxes and a Sperry on state dignities at Headquarters Building on the main runway—Wattenham long since has become a jet fighter base and, in the event of actual war, would be in the front line since it is fairly close to the English Channel.

Wattenham also is the base of No. 111 Squadron, the widely acclaimed



AVIATION pilot on show flag up their engines for an early morning scramble. No. 41 Squadron had no share in this exercise.

Nuclear Attack

Tackle One squadron of aerobically fit men today. Tackle One now is phasing down the bomber into Lightnings and did not participate in the exercise on an alert basis. Most Tackle One pilots continued their normal Lightning simulator and ground school duties, except where nuclear fallout forced them into station emergency routines.

Because of the relatively high speed with which the Lightnings and Javelins now can be launched, the airplanes no longer are in dispersal areas, both squadrons, No. 56 (Lightnings) and No. 41 (Javelins), remained as readiness is being kept by the main wing.

On this visit, the squadrons went on 5 min. alert at 5:35 a.m., by 6:30 a.m. the pilots were on 10 min. alert and were in the cockpits with ground crew standing by for starting. Scramble order at 7 a.m. and the first Lightning was airborne in 2 min. 30 sec. from the rail.

In all, the alert involved two Lightnings and 15 Javelins, nine Javelins and three were on major maintenance grounds. One Lightning accounted for a head but only because it ran due for engine change and had not been scheduled for that day's alert.

The airplanes were scrambled in a row, in that Javelins took off behind Lightnings, in two rows, depending on which engine reached the lift-off point first. To the ground observer, the birds all were climbing often, airplanes were each a few hundred yards apart with gear coming up, and the first Lightnings immediately passed the Javelins in the pattern.

Lightnings, not engaged with afterburners on their Rolls-Royce Avon jet



AVIATION pilot and wingmaster operator visit Wattenham Tower scramble signal.



BEST PHOTO of an English Electric P1 Lightning jet fighter refueling from an English Electric Canberra bomber jet bomber modified for aerial tanker role. Lightning is fitted with probe under left wing, despite intercepts are hunting on belly of the Canberra.



ENGLISH ELECTRIC Lightning pilots show their aircraft on 5 min. alert at Wattenham RAF station. Only one of these Lightnings was kept on ground during scramble. Better in most strike of each plane contains Frenchman's Aspern role.



LUNAR PROBE



The moon — lacking an erosive atmosphere — may hold the key to the history of the solar system. Because of this lack of atmosphere, craters, volcanoes, and wind-eroded formations may help solve fundamental, universal questions.

Logically, the moon will be the first objective in the exploration of space. Initially the moon itself will be photographed and instrumented, then manned observation stations will be established for astronomical and meteorological purposes. In time, the moon will serve as an intermediate station enroute to other planets — step by step into infinite space.

The National Aeronautics and Space Administration's Lunar Program will utilize Lockheed's AGSNV II satellite to play a significant part in forthcoming lunar expeditions — as well as a host of other scientific space missions. The NASA lunar launch in 1969-72 will utilize the highly reliable Lockheed AGSNV as second stage to carry the RANGER spacecraft. The AGSNV will provide the extremely critical guidance and control commands to place the RANGER on the required lunar impact trajectory.

The Lunar probe also demonstrates the versatility, reliability and success of the AGENA vehicle as Lockheed's satellite and spacecraft program is expanded for the Air Force for use in the DISCOVERER program. The AGENA also is utilized in the MIDAS missile defense alarm system. Noted for a record of outstanding accomplishments, the AGENA is credited with being the first to be placed in a polar orbit, first to achieve a precise predicted and verified apolar orbit, first to attain attitude control in orbit, first to eject a reentry capsule which was successfully recovered. The AGENA has been needed for a variety of missions such as navigation, geophysical investigations, long range communications and deep space probes.

Lockheed's capability in satellites and spacecraft, manifested by both an achievement at the AECNA, encompasses the entire field. It includes current and long range programs such as interplanetary probes, global and space communication systems, and manned space travel.

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*Systems Manager for the Navy POLARIS FBM and the
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Ultra-high shearing speed never was lowered through honeycomb panels under water to prevent bending.



Mach 3 Manufacturing

Sounding out the inner secrets of brazed honeycomb panels Manual assembly is built with brazed panels of stainless steel honeycomb in order to fly far faster at supersonic speeds. But inspection of these panels becomes a major problem because the interior of brazed honeycomb panels cannot be seen.

To solve this problem in designing the Air Force's new B-70 Valkyrie airplane, a special Quality Control Development Program was undertaken at the Los Angeles Division of North American Aviation.

The result: ultrasonic inspection, a process that works like the Navy's sonar system for locating submarines. By converting each finished panel into a tank of water and

then transmitting a warning lead over it, sound waves are transmitted into the panel and reflected back to the same original lead. The reflections are recorded on plastic sensitized paper for a permanent record of every minute area when honeycomb and skin are joined together. Any area that has been improperly brazed will show up instantly.

This method of inspection is just one of the many processes and advances in Mach 3 manufacturing that have been evolved by North American development programs. Other advances cover the full spectrum of hypersonic fabrication. As a result of these programs, North American Aviation has met the challenge of Mach 3 manufacturing.

Builders of the B-70 Valkyrie

THE LOS ANGELES DIVISION OF NORTH AMERICAN AVIATION, INC.

cargoes placed one atop the other but their wire cut and during the shift. The airplane has an extremely high rate of climb and must reached operational altitude while still in sight of Wattenham. Later in a demonstration a light snag among the berries, less all the ground in less than half the 9,000-ft. service, and its control showed up less than two minutes later, when the airplane probably was passing through 25,000 ft.

Not long after the assembly of "recovery house" was dropped near the Wren, north of Wattenham and the field personnel went into a machine gun one that worked even when the machine gunners and others. All assigned to damage control and took their stations and sustained without drive them under cover in this way, any back structure.

Victory before leaving is a way of life at Wattenham, according to Group Captain R. P. T. Skelton, the station commander. Drills are called on quickly, with no warning, and all parties with exception of station watch personnel who, incidentally, do most of their job using with specially trained police dogs.

This particular assembly involved an attack on Victory before leaving the United Kingdom from the resistance. The Lightnings and Spitfires were ordered to attack positions from inside the ground control system directed from Fighter Command Headquarters at Bentley Priory, Staines, near London. (Office in charge was Air Marshal Sir Hector McGregor, Fighter Command chief. The Valkyries were directed by Air Marshal Sir Kenneth Cross, head of Bomber Command.)

Although the two squadrons based at Wattenham reported 100% success in their attacks, using both Firesticks and cannons, none of the Valkyries penetrated the U.K., resulting rather heavy damage. In an unexpected number of cases, these bombs "buckled out" fighter bases and then, after their attack, were lost. Often when a base was "buckled," the aircraft had been assembled and were ordered, in a secret, they were sent to operational sites by Fighter Command control. One fighter pilot landed on three different bases, two in Yorkshire and another in Scotland, in a single dramatic period because his base was eliminated.

The hazard of nuclear fallout was eventually emphasized and it affected the missions in other ways than airport damage. For instance, in a number of radio sets were subjected to heavy fallout and the personnel considered dead. This was caused by a quick shift in the dose rate to other methods of detection, including mobile work.

In the Wattenham area, "nuclear fallout" was pronounced and, at one po-

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"Air born" of
experience in
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The A2F-1 Intruder

- Illustration shows aircraft's operation of Grumman PAF-Pairer operating in Norway
- A2F-1 Intruder with tail of A2F-1 Intruder shown in silhouette of A2F-1 Intruder



This is the Grumman A2F-1 Intruder attack aircraft—an airborne weapons system developed for the basic purpose of fighting a limited or brushfire war. It was based upon limited war combat experience gained in Korea.

The A2F-1 Intruder "sees" in total darkness, "sees" through bad weather, to search, detect, track, and kill a proposed target. So regarding our freedom cannot wait for clear weather or daylight. In fact, the crew of the A2F-1 can destroy the proposed target in any weather or darkness without ever having to see it.

Operated as an air-to-ground, missile-carrying aircraft, or equipped to carry conventional weapons of all types as well as nuclear weapons, the A2F-1 Intruder provides the U.S. Navy with an all-weather attack aircraft with extended range and heavy weapons capacity. In earlier attack, the aircraft can come in low under enemy radar, low low for effective interference by enemy aircraft and ground fire.

The Intruder provides a new capability to close up port weapons—provides the nation with a powerful defense to protect war and promote peace.

GRUMMAN

AIRCRAFT ENGINEERING CORPORATION

Bethpage • Long Island • New York



rod of the rock road, was up in the 200 something area. During this time, the line took on a doctored report, with all eyes under cover. Later, while the call was following a Lightning scramble as a Hunter 17 (two place trainer), the flight was scrubbed by Watakins command and was returned to the wing, a "nuclear bomb" had landed and the area control and emergency units could handle only airborne aircraft.

At no time were Watakins's senior officers, Group Capt. Hawley, Wing Commander (Wing) A. D. Woodcock, or Wing Commander (Technical) L. J. Jenkins, aware of attacks. Several times pilots went on cockpit alert, only to have the mission cancelled. At an other station, however, one pilot flew five sorties in a 24-hr period. On the final day, Fighter Command paid to the air against more than 250 sorties attempting penetration from the north west. This attack involved use of all three components by aircraft to complete the interception job.

Fighter Command spokesman noted that since the West Europe Air Defense effort, continental order was made by each nation. The command also maintained a direct link with North American Air Defense Command (NORAD) headquarters in Colorado Springs, Colo., to report developments.

This incident was planned with the intent of warning both military and defense aircraft could expect from airplanes and missiles launched from the Soviet Union. The threat was 15 min for supersonic bomber and 40 min for subsonic bomber, down to 4 min for a 550-mi range ballistic missile. The set the pattern for the pilot alert status—10 min (alert), 10 min (ready), 5 min (black) and 3 min (ready). Another alert is the cockpit alert, on red and black, pilots are on the line but not necessarily in the aircraft.

As part of the nuclear deterrent, first in the line, there is a line from command England from Yorkshire to Norfolk, now also on an alert status. On the civil defense phase, about 15,000 members of the Royal Observer Corps, all volunteers, took part in nuclear alert and follow actions.

PRODUCTION BRIEFING

Collins Radio Co., Cedar Rapids, Iowa, has signed contracts totaling \$1.3 million to install radio sets in various distant military and government facilities. The contracts include such as: Air Force, corporate aircraft services and Lockheed Aircraft Corp. The Federal Aviation Agency is operating 144 Vortex stations and plans 513 installations by 1966. The industry is operating 125 DME-compatible Telenav stations.

Nortrop Corp.'s Norton Division will assemble guidance and heat beam characteristics of liquids in a single environment under a six-month research contract from National Aeronautics and Space Administration's Lewis Research Center, Cleveland.

Aeronutronics Division of North American Aviation, Inc., Downey, Calif., will produce ship's tactical navigation systems (SINS) under \$21 million Navy contract. The navigation system for the new Submarine class, first Submarine missile submarine. The contracts call for three SINS for each submarine plus spares.

Boech Aircraft Corp., Lincoln, Ohio, will build 75 tapping control units for the Atlas KC-135 under contract from General (Aeronutronics) Division of General Dynamics. The tapping control unit is built into the mainline wing to provide liquid nitrogen to the Atlas immediately prior to launch.

North American Aviation's B-70 bomber crew compartment will be tested under simulated flight loads in a lightweight tank being installed on the company's Aerobics Laboratory. Loads as high as 70,000 lb will be applied to the fuselage structure through a dynamic noise section Hydraulic pulse will exert

DELIVERY: One Week Sooner

Completely automated spare parts ordering conforming to ATA Spec 200, and covering the most important products. It is in service in new versions from Airwork. Three major airlines now use this time and money saving service.

For the past year and one-half, Airwork has been saving important lead time in airline provisioning and replenishment. This reduction in lead time has reduced customer capital requirements and inventory... produced other important savings.

For full information, call your nearest Airwork branch office.



Essential services to aviation. Airwork Corporation, Millis, New Jersey.

THEY ALL HAVE GENERAL PRECISION IN COMMON

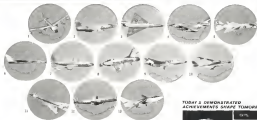


Manned aircraft of the aerospace age share a common reliance on General Precision's electronic and electromechanical systems in the performance of complex missions. Nearly all advanced aircraft flown by our armed forces incorporate General Precision navigation and heading reference equipment. In addition, the fleets that man the aircraft have been largely trained on General Precision flight simulators.

The four divisions of General Precision, Inc., are consolidated for the systems management of major new weapons and space projects. As a result, a manned-aircraft systems program can draw upon more than 16,000 General Precision employees (including 4,500 scientists, engineers and technicians) and well over 254 million square feet of combined plant space.

This combination of talents and facilities, backed by the corporate financial resources of General Precision, Inc., makes it possible to develop, produce and manage any advanced system for manned aircraft.

- ① B-52 STRATEGIC BOMBER—Inertial system for heading and vertical reference and for accurate release of Forward Drop and Standoff weapons. Doppler drift/track system—by General Precision.
- ② F-104A SUPERSONIC FIGHTER—All altitude reference system by General Precision.
- ③ F-105A SUPERSONIC FIGHTER—Flight simulator and stable coordinate reference system by General Precision.
- ④ B-56 SUPERSONIC BOMBER—Flight simulator by General Precision.
- ⑤ F4U-1 SUPERSONIC DAY FIGHTER—Flight simulator by General Precision.
- ⑥ A-1H NAVY ATTACK BOMBER—Weapons system simulator—including flight radar and ground mapping simulator—by General Precision.
- ⑦ KC-135 JET TANKER—Doppler system and directional gyro compass system by General Precision.
- ⑧ F-100 SUPERSONIC FIGHTER—Doppler system—navigation computer and directional gyro compass system by General Precision.
- ⑨ RF-101 SUPERSONIC RECONNAISSANCE FIGHTER—Doppler system and roll-yaw-stabilized directional gyro compass system by General Precision.
- ⑩ RB-47 RECONNAISSANCE BOMBER—Doppler system—directional compass system and heading/track computer system including flight simulator—by General Precision.
- ⑪ B-70 HYPERSONIC STRATEGIC BOMBER—Ultra-high accuracy General Precision Doppler equipment for the bomb-ay system.
- ⑫ KC-130B EARLY WARNING RADAR AIRCRAFT—Doppler sensor. Doppler sensor/compass/heading Azimuth, lateral gyro reference system and directional compass system by General Precision.
- ⑬ A-1H NAVY ATTACK BOMBER—Bombing/navigation computer by General Precision.



TODAY'S DEMONSTRATED
ACHIEVEMENTS SHAPE TOMORROW

	TELE
	HEADQUARTERS
	LIBRARY/SCOPE
	LINK

GENERAL PRECISION, INC.

GENERAL PRECISION DIVISION OF GENERAL PRECISION CORPORATION
Tarrytown, N.Y.

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Bausch & Lomb capabilities turn blips into aerial photos in any weather, day or night.

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In use, this system strips the concealment of night and weather from enemy activities. In peace, it can help picture the face of the moon. The same integrated Bausch & Lomb skills that developed this system from design through fabrication are ready to help on your project. Write us for full details. Bausch & Lomb Incorporated, Military Products Division, 80018 Bausch Street, Rochester 2, N. Y.

BAUSCH & LOMB

different forms to simulate rough weather and massive conditions.

Kellogg Instrument Corp., Elmsford, N. Y., will produce automatic data computers for the Boeing B-52 under 505 million. USAF's newest bomber star trackers are produced by the company for the Canine B-58, the North American Hound Dog air-to-surface missile and submarines.

French has received contracts amounting to \$50,000 from the Goddard Space Flight Center to research and develop means of detecting atomic gases in outer space. Research will concentrate design and construction of laboratory systems for production of free radicals, particularly atomic oxygen, hydrogen and nitrogen.

Electro-Optical Systems, Inc., Pasadena, has won a large multi-panel fiscal contract for engine reconnaissance for 175 hr. with no follow-on, under a research and development program for USAF's Automated Systems Division.

Aerospac Controls Co. has been formed to develop and manufacture special instruments and controls for space travel and related applications. The new firm is located at 601 Colorado Avenue, Santa Monica, Calif.

General Electric Co. has been awarded a \$24 million contract extension from Navy for production of the AN-505 50 laser range-finder. The range-finder is a total of \$50 million committed to the project.

Hillcrest Co. has awarded a \$550,000 Signal Corps contract for an airborne target simulator system which will create ICBM signals without the use of target simulators.

Boeing B-52 is being outfitted with Instrumentation Systems Machines Corp. advanced night-vision night-vision provides flight crew with terrain display for operations at altitudes less than 1,000 ft.

First Comair B-58A Hustler supersonic bomber has been delivered to 445th Bomb Wing of Strategic Air Command's 19th Air Division based at Barksdale AFB, La., commanded by Col. Frank L. O'Brien. Personnel of the 19th are trained by the 41st Bomber Wing, Carroll AFB, Tex., first wing to receive the Hustler.

Golfer Radio Co. has been awarded two contracts totaling \$1.5 million for communications navigation and identification (CNI) airborne systems and another for \$140,000 for CNI ground support systems.



Boeing 727 Wing Geometry, Nacelle Flight-Tested on 707 Prototype

Entire leading edge of the 707 prototype has been modified to install Krueger nose flaps between fuselage and nacelle periplast and data from the nacelle to wingtip for lightening of wing geometry and nacelle nacelle of Boeing 727. Leading edge of wing has been modified to install nacelle periplast, a periplast to nacelle joint line. Inboard flaps are double-slotted, double-actuated type, and are not retractable for prototype tests. Instead, series of flaps has been built, each set having a different amount of deflection from zero to about 50 deg. full deflection. Engine nacelle, built around a Pratt & Whitney JT7, is mounted in geometric position of nacelle on station on the 727. Tailpipe of test engine is oriented up to get exhaust discharge above horizontal tail of the 727. Nacelle and inboard section of port wing are built for evaluation of flow conditions at high angles of attack where lift and wing are approaching stall.



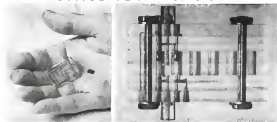


Once off the firm footing of earth, the most critical need of any vehicle is for precise *direction*. The straight course of a sub, a ship, a jet... the precision track of missile or space vehicle... these result from a directional reference of superior accuracy; the kind provided by gyros made at Sperry. Whatever the application, gyros by Sperry have a common denominator: stability. Sperry is dedicated to, concentrates upon, stability—absolute directional accuracy, absolute repeatability. The result is seen in the widespread technological successes achieved at the direction of the Sperry gyroscope. General offices: Great Neck, N.Y.

Sperry gyros are the precise direction reference in these and many other applications: proposed navigation for the Polaris submarine, tracking the advanced missile such as the B-5, automatic navigation flight controls for the F-105 and other aircraft, precision bomb aim system for the B-57, "Kerfley" gyrocompass system for space vehicles (submitted in patent application).

SPERRY

SPACE TECHNOLOGY



PNEUMATIC digital computer, under development by Kerfley, will supply five preprogrammed flip-flops. The black package contains six pneumatic flip-flop elements. Large, transparent aluminum model is shown alongside at left. Cheaper (right) of transparent model shows two kerfley elements at left and provides for adding five more elements at right. Computer can in fact build 3,000 such elements in one cubic inch volume and produce pneumatic digital computer that measures only 15 x 15 x 3 in.

Pneumatic Computer Suitable for Space

Digital computer that uses air/gas operated flip-flops and diodes instead of electronic elements, enabling it to operate at temperatures up to 2,000°F in a severe radiation environment, is being developed by Kerfley's a division of General Precision, Inc.

Three characteristics, coupled with the small size, weight and low cost, suggest that the pneumatic digital computer may find use in space vehicles for guidance and control.

Proven Sited

Proposed to date primarily Kerfley's to predict that pneumatic digital computers will be able to operate at clock frequencies of 10 to 100 kc, a mod-out speed which should be adequate for many applications.

Company says that approximately 3,000 pneumatic flip-flops and their interconnecting "circuit" and power supply can be built into a one cubic inch package.

A medium size general purpose pneumatic computer, complete with memory, is expected to measure only 15 x 15 x 3 in., according to Kerfley.

Kerfley's is not alone in the pneumatic digital computer field. The Soviet Union is known to be active in pneumatic computers for computing, as is the International Business Machines Corp. Lab. system in Zurich, Switzerland. Army's Dugway Ordnance Research Laboratory (ODRL) also is experimenting with pneumatic digital computer technology.

In the Kerfley pneumatic digital computer, pneumatic analogs primarily are substituted for more familiar electronic elements in order to permit the use of silicon computer logic drops, according to company's Hugh E. Kierdes, senior staff engineer.

For example:

- **Pneumatic diode** is an orifice that operates above critical flow, i.e., with gas flowing through the throat at or above the speed of sound. Under such conditions, a pressure disturbance originating upstream of the orifice will never downstream through the throat, but a disturbance below the orifice can not propagate back upstream. Because a pneumatic diode is an orifice, or cylinder, a pneumatic equivalent of a simple diode logic circuit requires only appropriate interconnection of orifices and cylinders of various sizes.
- **Pneumatic capacitor** is a plunger cylinder.
- **Pneumatic inductor** is a "long" type of sufficiently large diameter so that viscous losses do not predominate.
- **Pneumatic bistable element (flip-flop)** employs a small ball shaped shuttle in a cylindrical housing having four tubular connections. The ball is able to move freely from one end of the cylinder to the other.

The pneumatic flip-flop elements can be operated in a number of different ways. Kerfley says one of the simplest arrangements is shown on p. 15.

A common pneumatic supply at pressure is connected to the flip-flop's two inlet connections (1) and (2) through separate flow restricting orifices. The inlet connections (3) and (4) are open to the atmosphere.

With the ball initially located at position "A" inlet (1) is closed by the ball so that the pressure at this point is equal to the supply pressure. There is flow through inlet (2) and out through (4), and since the ball does not provide a leak tight fit in the cylinder, a small flow passes around the ball and out through (3).

Under the conditions where an orifice below the ball, which, with proper choice of design parameters will keep the ball at (A) so long as side connections (3) and (4) remain open. But if inlet connection (1) is closed, pressure on both sides of the ball will equalize because of leakage between the ball and the cylinder wall. In addition, there will remain a force acting on the surface of the ball in the direction of inlet (2) as well as the inlet (1) will act as the drive force of the ball and force it rapidly toward position (B).

If the operation of (1) now is reversed, the ball will remain at position (B) under equilibrium conditions that previously prevailed when it was at position (A). If connection (2) now is momentarily closed, the pressure

This is systems capability at NAA-Columbus

The Columbus Division of North American Aviation is one of the most complete centers of advanced systems technology in the world. Much of the progress in our modern technology was pioneered in the extensive facilities operated by the Columbus Division. Here practical production evolves swiftly from original concepts. Economy through efficiency is the constant theme. This is true systems management capability...this is the Columbus Division.

COLUMBUS DIVISION OF NORTH AMERICAN AVIATION



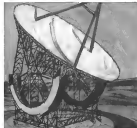
Columbus, Ohio



TWIN-ENGINE TARGET MISSILE. New target missile NA-215 can carry out high- or low-level missions equally well. It performs from ground level to 80,000 feet, and from subsonic through Mach 2. Under development for the Army by the Columbus Division, it is launched by a rocket, and powered in flight by rockets.



AGE VERANO. Navy's ASG set a new world's record, flying to 51,450 ft. carrying a payload of 2,204 lbs. The verano, carrier-based ASG set performs high or low level missions in any weather, from any altitude, day or night.



They are "JAN." World's largest radio telescope reflector, six hundred feet in diameter, is being built by Columbus for the Navy at Sumner Grove, W. Virginia. Columbus is also building a complete antenna system for the USAF.



VITAL FACILITY. New six-degree-of-freedom flight simulator is part of facilities set up by Columbus Division to study requirements of vertical and short takeoff and landing aircraft design and development. Other VITAL facilities include low-speed to transonic wind tunnel and unique lightweight aircraft test.



BASIC pneumatic bistable element can hold in cylinder with two vents at each end. One (1) is closed, closing vent (2) while (4) is open will cause ball to shift to bottom of cylinder and remain there when vent (3) is reopened. Ball can be returned to original position by closing vent (4) while (2) remains open.

described process will be reversed and the ball will shift rapidly back to position (A) and remain there after construction (4) is reopened.

The pneumatic bistable element also can be operated by applying a pressure pulse to the radial connection which has the same effect as reducing outward flow, as closure of the vent, providing a pulse-responsive pneumatic flip-flop. This mode of operation provides faster reaction time.

The output of the bistable element, for interconnection with similar units or the required computer logic, appears as a pressure drop across the supply orifice which actuates a load resistor in a voltage divider circuit. As with electrical circuits, the design requires "impedance matching" and an interconnection of loading requirements. To accomplish these functions Kerfitt has designed pneumatic buffering, amplifier and isolation circuits.

While most electronic circuit elements are best suited for bistable operation, pneumatic elements can be designed for monostable operation. One, which Kerfitt has designed for use as a binary switch, has a fifth connection at the center of the cylinder, in addition to the two at each end. When this center connection is open, the ball is driven to the center of the cylinder and remains there regardless of the condition of outlets (1) and (4). When the center outlet is closed, the device behaves as a conventional bistable element.

The use of moving balls in the Kerfitt pneumatic computer elements does not make them susceptible to spurious operation under shock/vibration conditions, the company says. When a bistable element has a 100-psi differential pressure across its terminals, a shock of more than 50-100g would be required to disturb the element, Kerfitt says.

A number of concurrent means can



Complete ground training, pre-flight and flight maneuvers with the NEW "WHIRLYMITE" HELICOPTER SELF-TRAINER

Del Mar offers a dynamic new system to train helicopter pilots, the Whirlymite Self-Trainer. It is not a simulator, but an operational helicopter suspended on a highly mobile, amphibious platform. The unique assembly of the platform permits full freedom to rotate in azimuth, rise vertically and tilt in all dimensions. Thus, the trainee practices all "in flight" maneuvers without ever going more than inches off the ground—with the complete security of the movable, amphibious platform beneath him. Because it allows free movement across the ground without friction, the amphibious platform makes this system the first ground trainer capable of achieving translational lift speeds in forward flight.

The Whirlymite Self-Trainer is designed to move the student through primary training right up to solo flight, without

requiring dual flight instruction. That means a single instructor can handle a number of students simultaneously through the training program. And when the primary training is completed, the Whirlymite may be easily detached from the platform to become an operational helicopter.

For complete information on this versatile, low-cost training system, write for Data File AW 1544-1.



INTERNATIONAL AIRPORT
LOS ANGELES 30, CALIF.



The one-man operational system in the adjacent flying mode has successfully completed 33 hours of flight before

Drive mechanism in (right) ground mode emerging while hoisting the Whirlymite into the air, demonstrating flight capability

be used to convert electrical input signals to parameters for introduction into the computer, and for converting its output to electric signals for display or other utilization.

Electromagnetic coils or electrostatic plates can be used to force the ball of individual pressure elements into the required position in their channels. To sense the position of the ball, for conversion of computer output, an electrical and capacitor plates or contacts embedded in the cylinder walls can be used, Kierulff says.

Because the variable elements operate on the basis of pressure differentials rather than absolute pressure, a pressure computer does not require extremely precise control of supply pressure (compressor or leakage within the unit).

No checkoff units are required and it is only necessary that certain steps be in linkage with the right time and appropriate sequence.

Packaging Density

To achieve maximum packaging density, Kierulff proposes to construct pressure-sensitive digital circuits from layers of perforated plates which can be made in mass production techniques and assembled to provide both the computer elements and the required interconnections between elements. This should permit miniaturization of parts and fabrication with only a few tolerancing operations.

Present thinking calls for the use of five perforated plates and two solid outside plates. The outer pair of perforated plates, called control plates, will contain a hexagonal pattern of grooves in their two faces. Circuit connections can be made by drilling through the outer plates at the appropriate intersections of grooves.

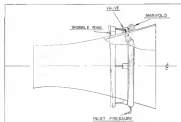
For accurate temperature operation, the control plates could be made of an material capable of being heat-treated by chemical etching or photo-etching.

For high temperature operation, ceramics at high temperatures also would be used.

Typical tolerances and critical dimensions for pneumatic computer elements might be as follows:

- Cylinder diameter: 0.010 to 0.001 in.
- Moving element diameter: 0.010 to 0.001 in.
- Port/cylinder diameter: 0.010 to 0.004 in. (0.003 in.)

These tolerances are within the capabilities of existing machine tools and techniques. Kierulff points out: The small size of orifices and passages will, however, require the use of clean gas in a gaseous medium such as helium. In that extreme particle size, the computer unit



DIRECTION of bypass gas into the nozzle exhaust flow is being studied by Aero-Ford for thrust vector control of large solid boosters. Helium valves, located 90 deg. apart on a manifold, feed bypass gas into stream, changing shock wave within nozzle. Wide-angle nozzle shown.

Gas Vectoring for Solids Studied

New York—Injection of bypass gas into the exhaust of a solid rocket engine is being studied by Aero-Ford Inc., Princeton, N. J., for thrust vector control applications on large solid propellant boosters.

Under the concept, called "flow transverse differential momentum injection" by the company, a thrust vector control system would work like this:

Dyna-Soar Components

Subelements under the Air Force's Dyna-Soar space glider program have been awarded by Boeing Co. to:

- Thompson Research Corp., the Texas Group, Cleveland, Ohio, which will provide Dyna-Soar's motion control power component under an R&D contract exceeding \$2 million. The unit will enable and control the glider during flight through open air where the aerodynamic loads are not completely effective.
- Inboard Corp., Denver, Colo., which will develop an altimeter power unit for the glider under a \$400,000 contract.

The glider's hydrocarbon gas jets will power the vehicle's gimbal in flight will consist of a reaction chamber, power source, gas line, hydrocarbon pump, propellant shut-off valve and actuating valve and controls.

General Corp., Los Angeles, which will develop a hydrocarbon engine under its Dyna-Soar program, expects from a storage tank will feed a heat exchanger to absorb the heat released from gases and equipment components.

Hot gas is bled from the motor's combustion chamber and introduced into a complex manifold near the base of the nozzle.

Four valves, located 90 deg. apart on the manifold and partially open at all times, evenly bleed the gas back into the main exhaust throat. As pitch, roll or yaw movements become necessary, the guidance system actuates a wide-angle shock in turn, mechanically controls closing or further opening of valves.

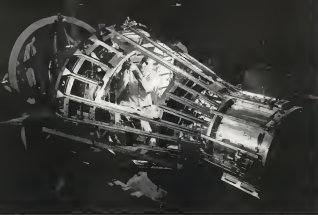
Shock Waves Modified

At the wide-angle opens one or two valves on one side of the nozzle, it also closes the opposing valves to an equal degree, thus modifying the shock wave pattern and producing an unbalanced force within the nozzle.

Aero-Ford claims that a continuous, rather than a pulsed, or intermittent injection system is preferable because the former maintains constant thrust and the use of pulsed gas flow rate must a temperature drop in the exhaust flow.

Also in the continuous system, where the valves are then a slightly open, large forces are not required to move the valves against chamber pressures of 80 psi or higher.

The company said that the valves which must function smoothly and rapidly at high temperatures and in a corrosive environment, are the critical link in a continuous injection system. Such a hot gas valve has been developed. Aero-Ford said, and will be tested soon.



Mercury capsule with titanium joints, of the vacuum arc-welded and machined joints

45,000 inches of welding

Titanium construction clinches record of reliability with Mercury capsule!

Mercury's astronaut, and all that was at stake with him, rode out the big shock safely in a titanium structure. Chosen for its light weight, its strength and rigidity at high temperatures, its ease of fabrication, titanium has proved another milestone in its growing history of reliability.

Proper Mercury's pressurized capsule, its antenna and parachute housings and the adapter station joining it to the booster are basically titanium structures. They consist of a titanium outer skin attached to a framework of titanium stringers and rings. Beryllia-reinforced Kevlar 49 has stacking "bladders" are fastened to the outside of the capsule.

The use of titanium has saved "considerable" weight over other metals of similar strength and endurance in the all critical weight battle in the Mercury capsule and adapter station where ounces were fought for.

This report has been prepared by Titanium Metals Corporation of America in the belief that performance of titanium in the space capsule may provide information of use to you in design and construction of weight-critical airborne structures, whether they be in VTOL or STOL aircraft or vehicles to operate in space.

Rigidity and strength at high temperatures... and 20 G's! Shaking off pounds was not enough for Mercury's designers. One of the big factors in the selection of titanium... which is as strong as most steels... yet weighs 44% less... is its ability to retain its strength and rigidity at high temperatures.

During the launch phase, the all-titanium adapter section reaches 500F. The titanium stringers in the capsule reach 500F. During re-entry, the outer skin reaches 300F. Here titanium's consistency proves its high performance and reliability. Mercury capsule is designed to withstand 20 G's.

Titanium construction inherently rigid. Titanium lends itself to an accuracy after construction free through its modulus is somewhat lower than steel's. The answer is a greater cross section made possible by the less dense titanium. Moreover the metal will retain its stiffness over a wide range of temperatures.

Added stiffness and efficiency can be gained by "impregnating" or bonding. Mercury outer skin... which is also the outer inner wall, consists of two layers of 0.007" wire-mesh type titanium, welded together in places a single "sandwich" structure. The inner layer is flat-rolled. The outer layer has been stiffened with corrugations approximately 3 inches in length and 1/4-inch wide. The result is a 0.007" thin inner section that is equal in rigidity to an 0.007" section. 130% increase in efficiency.

45,000 inches of reliable welds per capsule. Proper Mercury capsule, in addition to its high G loadings and temperature requirements, is pressurized to maintain its cargo of human life. Welds must be reliable.

According to McDonnell Aircraft, St. Louis, Mo., developers and manufacturers of the capsule, there are 25,000 inches of seam and butt weld and 20,000 inches of spot weld in each capsule. 45,000 inches of welding. The performance has been repeated in 20 production capsules.

Here indeed is a better focus on the reality of titanium welding!

All fusion and seam and spot welding was done "open air." Fusion welds were non-gas shielded, argon-free, using shielding and backup shields. Welds are as strong or stronger than parent metal, McDonnell reports.

Spot and seam welding was accomplished on standard production equipment... with hydrogen welder in those cases used on the titanium steels.

TIMCA: your information source. If your metal or structural problems involve special requirements for a rigid, high strength structure at temperatures from minus 613 to plus 3000F... with high corrosion resistance, including immunity to atmospheric attack, titanium may easily be your best answer. The reliability on which the makers of the Mercury capsule placed their faith can work for you.

We suggest you get in touch with the nearest Titanium Metals Corporation of America sales office or write directly to our Technical Service Department for information on titanium applications... fabrication... component fabrications. Why not write today...



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CORPORATION OF AMERICA**

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Titanium lower skin consists of two threaded plates 48 1/2" high by 8 1/2" in bore, welded together. Cores are formed from tapered metal, butt-welded together. One core consists of 0.007" beaded titanium, for added stiffness. The other core is flat rolled 0.007" titanium. After heat treating, each core is hydrostatically pressure tested.



Cores are joined by seam welding. The beaded core on the outside, following spot-welding for position. Approximately 16,000" of seam weld are used in each capsule. A cross-sectional view is made between each subcapsule and a vertical pass adjacent to the corrugations. Beaded cores are also proof tested.



Basic titanium capsule structure consists of welded, two-layered skins which are spot welded to the titanium frame. The housing and adapter sections are not pressurized and consequently the skins are riveted to the frame in these areas.

Soviet Shuffle Keyed to Practical Science

Moscow—Harris is ruminating its own scientific research program—initialing space and aerodynamics—in an attempt to give greater emphasis to the application of practical technology.

Latest move is the general reshuffle of the appointments of its academic elite. Minister V. Keldysh, to head the Soviet Academy of Sciences. Described as a market engineer and the nation's leading space mathematician, Keldysh succeeds Alexander N. Nosovskiy, 62, a chemist. Nosovskiy stepped down at his own request, according to the Academy announcement.

The Soviet Academy of Sciences formerly had five control over USSR scientific research and education, but last month the Kremlin divided the State Scientific and Technical Committee and gave broad powers to the new State Committee on Coordination of Scientific Research. The new committee can decide research emphasis in any area, including those recommended by the Academy.

Both moves apparently reflect a growing dissatisfaction with scientific efficiency, and the delay in isolating technological innovations (ENR Feb. 15, p. 11). The Soviet Academy has frequently been criticized by Soviet officials for being an uncoordinated organization, where workers are preoccupied with non-practical theoretical problems. Keldysh, of Keldysh, who was suggested by Nosovskiy, came at a meeting of the Academy in mid-March. Nosovskiy remains a member of the Academy's Presidium.

Keldysh has specialized in the study

of motions of bodies in fluids. For several years he supervised research into dynamic strength and vibration of aircraft. He is credited with creating the theory which led to control of sudden flutter in aircraft wings, and to the development of nose wheel steering in aircraft landing gear.

The new Academy president also is credited with development of computer mathematics, automatic controls and robotics.

His studies in aerodynamics contributed to Soviet missile airframe development.

The Soviet press is plotting great stress on Keldysh's duties as an engineer, and in accepting the post, he has full support of Premier Nikita Khrushchev's reorganization of the Soviet Academy.

Nosovskiy has admitted to the Soviet press that the huge network of Academy institutes has been "difficult to control," and the Academy has been directed to form a number of its institutes over to state committees, ministries and departments.

The State Committee on Coordination of Scientific Research, working directly under the Council of Ministers, is headed by Lt. Gen. M. V. Khrushchev. State Scientific and Technical Committee, responsible for coordinating research and speeding its introduction into industry, was reshuffled, according to Soviet reports, because it contributed to "unintentional duplication of scientific research and the irrational use of scientific, cadets and material resources."

In chemistry, Khrushchev D. Priblud, has been "transferred to other work."

Further exploration of the Soviet scientific reorganization came with publication of the decision by the Central Committee of the Communist Party and the Council of Ministers, with the report that the most important task of all scientific institutions is to increase research in all areas, particularly those which have significant effects on the national economy.

Bringing of research closer to production and creating of most rapid introduction of results of research in the national economy require special importance in present day conditions," according to the announcement. It stated that the large number of departments, research subdivisions in the USSR Academy "disturbs the Academy from solving long-term problems in science and causes wasteful dispersal of funds."

Prime responsibility of Khrushchev's committee, according to the announcement, is "to guide the work research

embodiments are doing in key scientific and technical problems" in accordance with party and governmental directives. The committee will coordinate work of the USSR Academy of Sciences, the Union Republic Academies of Sciences and all major scientific and departments engaged in scientific research.

The new committee will work with top Soviet planning agencies to draft long-range scientific goals and establish plans for the introduction of scientific and technical achievements in production.

Stepping responsibility of the coordinating committee includes drafting plans for the national commitment in scientific problems, which presumably includes the level of effort for laboratory and applied research.

On Khrushchev's committee are the chairman for the State Committee on Automation and Machine Building; chairman of the State Committee for Chemistry, president of the Academy, vice chairman of the State Economic Council, chairman of the Committee for Inventions and Discoveries, and minister of Higher and Secondary Education.

Committee will be "a learned team

Solid Boosters

Dr. Squigley, Civil—Proposed capabilities for large solid propellant boosters were outlined in a twenty seven page report by the President's science and advisory committee's of his twenty panel which convened here at American Council for president by American Council, General Control Board Co., Inc., Rocket and Division of North American Aviation, Thiokol Chemical Corp., and Union Technology Corp.

At her twenty panel members appointed by Dr. James B. Watson, president and in the President for science and technology, included:

- Dr. Frank Loo (Astronaut, General Dynamics)
- Allen P. Donovan, Aerospace Corp.
- Dr. Harold W. Korman, Harvard University
- Dr. Donald F. Hoag, Princeton University
- Dr. John F. Kennedy, Institute of Defense Analysis
- Dr. Charles C. Lawrence, California Institute of Technology
- Dr. Frank T. McClure, Applied Physics Laboratory
- Dr. Robert F. Matthei, Space Technology Laboratories
- Dr. Allen E. Parker, Hughes Aircraft Co.



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Soviet Cosmonaut Medal

Russia has struck a new "1958 Pilot-Cosmonaut" medal which will be awarded to Soviet citizens making "outstanding flights into space." Design on silver medal features globe graced by a cosmonaut in orbit.

Convair 540 Conversion with Napier Jet-Prop Engines



Convair 540s undergoing modification with Napier Jet-Prop engines at AirResearch Aviation Service, the most experienced company in the modification of pressurized aircraft.

AirResearch Aviation Service converts Convair 340s and 440s into high performance airliners and executive aircraft with Napier Jet-Prop engines specifically designed for the Convair 540.

With over weather cruising speed of 326 mph and payload (range capacity of 80 passengers for 800 miles or 10 executive instrumental ranges), the Napier Jet-Prop 540 provides a smoother ride at greatly increased range levels and improved economy of operation in service as business transport.

An AirResearch auxiliary gas turbine installation (optional equipment) makes the Convair 540 self-sufficient as any landing strip. The on-board unit provides complete engine starting and all power for ground air conditioning and preflight checks.

Installation of the 3200-shp Napier JT404 Jet-Prop engines with four-bladed propellers includes

structural modification to engine nacelles, new radio installation, and electronic and radio system modification to maintain down time.

Conversion of Convair 340s and 440s to Napier powered Jet-Prop 540s is performed exclusively at AirResearch Aviation Service, the most experienced company in the modification of Convair 340s, 340s and 440s into executive airliners and luxury airliners. Employing more than 600 of the most highly trained and experienced engineers, technicians and craftsmen in the industry, AirResearch performs all design, engineering, fabrication and installation work in one location to meet the conversion, modification, maintenance and overhaul requirements of any aircraft.

Write, wire or telephone today for complete information regarding your Convair 540 conversion with Napier Jet-Prop engines.

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of consisting of prominent scientists representing different branches of science and engineering and heads of leading research establishments.

Committee will select "scientific councils" to work on specific problems. Soviet Academy, according to the report, "will select scientific and technological subsection responsibility. It will also "give more extensive assistance to Republican scientific academies, give scientific specialists and establish contacts with foreign institutions."

Missile Contractor Insurance Studied

Washington—Event in which the federal government should insure contractors against damages resulting from missile accidents will be tied to a new National Aeronautics and Space Act reauthorization study.

Outcome of the investigation will be a bill expected to undergo hearings soon by the Senate Aeronautics and Space Subcommittee.

NASA launched the study after its original indemnity bill ran into heavy criticism by members of the Senate space committee at a hearing on May 30. Sen. Charles F. Anderson (D-N.M.) expressed reservations about NASA's recommendation to make the government liable for an unlimited amount of damages.

He also noted that the NASA proposal did not require the contractor to carry private insurance as hazardous work to offset the government's risk.

"NASA Administrator James F. Webb and General Counsel John A. Johnson agreed that the agency was taking on the time risk, and the government furnishes to Pentagon contractors.

Webb and without federal indemnity contractors either are unable to undertake hazardous NASA projects at all or add a considerable premium to the contract price to cover the high cost of private insurance. Webb said it was more profitable for the government to protect contractors directly.

However, after Sen. Anderson and several other senators on the space committee studied the indemnity bill proposed by NASA, Webb agreed to draft a revised indemnity measure. The bill NASA will submit to the Senate after this new study is expected to set limits on federal indemnity and require the contractor to take private responsibility to cover part of his risk.

NASA is now studying the Pro-Aerospace Act which provides indemnity for contractors working on federal "front end" projects. They are expected to issue legislation from the act in drafting the new indemnity bill.

Master Blueprint Is Proposed for Space

Washington—Executive agency should be established to draft and direct a master plan for U.S. civilian and military space programs, according to a staff study just released by the House Science and Astronautics Committee.

The study said the U.S. space effort needs a new level of organization to act as an "executive agent for the President" and a "clearer definition of the relationship between the Defense Department and the National Aeronautics and Space Administration.

Capt. Howard J. Silberman, technical consultant to the House space committee, submitted these and other recommendations to committee chairman Orin Rosten (D-La.) Dec. 30, 1968. But his report was released only recently by the committee.

Silberman concluded that under the present space administrative organization as it is, charged with drafting on matters will then manage a work, but each agency on their efforts to others. Thus, he said, he would give to a space management office under the President.

The report also recommended two other space offices to provide coordination of direction and coordination of the President's space program, including research and development financing, the other to direct space operations in the field.

High Altitude Chamber To Train Space Crews

High altitude chamber designed to simulate zero, vibration, heat, humidity and altitude of the space environment is being constructed in Seattle for the Boeing Co.'s Boeington Division.

The 4210,000 company located in 1971 is being built by Vista Air Corp. for use in Boeing 707 aircraft and ground space crew indoctrination. Company expects to start using the chamber late this month.

The test section, 10-ft. long, 5-ft. high and 22-ft. long, will accommodate 15 crewmen simultaneously. Unique features, including its "Vibration" will be the ability to simulate rapid decompression and to control decompression and time to go from a rapid to an explosive decompression in microseconds.

Vista Air says the chamber will go to simulated altitude of between 20,000 to 80,000 ft. at 15 mph, and will have two-point variations from -60° to 220°.

Boeing, which is Vista Air's vehicle contractor, plans to use the facility to train space crews. They are expected to issue legislation from the act in drafting the new indemnity bill.

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to Convair/Pomona are found in all Dorsett-built telemetry equipment. That is why more and more of the nation's missile and satellite builders are specifying Dorsett equipment.

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AVIONICS



AN/GSN-11 terminal area traffic control system, now in service test by Federal Aviation Agency, was developed by Air Force to provide precision sequencing of aircraft in approach to land, to avoid landing delays. Operator at console controls both operations (left); operator of up to 16 aircraft under GSN-11 console assigns landing times and other sequence to meet all of emergency. Operator at each of three arrival consoles (right) is responsible for acquisition and control of up to six aircraft.

FAA Will Test GSN-11 Terminal Control

By Philip J. Klein

Convair-Air Force's AN/GSN-11 terminal area traffic control system designed to provide precise sequencing of aircraft approaching an airport for landing, will be shown this month to the National Aviation Electronics Exposition Center in Atlantic City for flight evaluation tests.

The GSN-11 is designed to handle up to 16 approaching aircraft simultaneously, providing each pilot with voice commands which tell him what his aircraft heading and altitude descent/altitude should be to bring the aircraft into final approach position at prescribed altitude. Besides this provides for sequencing up to six aircraft departures simultaneously.

The present equipment is a fixed government installation of the experimental GSN-3, better known as Vulture, developed and built right now up by the Air Force Cambridge Research Laboratories (AFCLR). The GSN-11, as well as three previous GSN-3 prototypes, was built here by Aero Industries and Electronics Division under USAF contract.

During the past year, the GSN-11 has been under evaluation here using aircraft radio transmitters, with more than 10,000 simulated approaches made during this period. In simulated runs made with 40 mi. landing extensions equivalent to landing 90 aircraft/hour, 97% of the aircraft arrived at the ap-

proach gate within 12 sec of their assigned time slot according to Ben Greene, chief of AFCLR's Control Section Laboratory.

This occasionally resulted in aircraft sequences which were less than those prescribed for civil standards, but which are acceptable for military operations, according to Greene. By reducing the capacity to 16 aircraft/hour (three landing extensions) the operations would be completely safe, according to Greene. This figure is twice the peak traffic handled by the best of today's large civil airports under IFR conditions.

Aero and Convair believe the GSN-11 could prove a valuable system for large civil airports. The GSN-11 is in competition with the state-of-the-art system which the FAA is now developing for both civil and military airports in the control but no proposals point out that it is a third-generation equipment which should have outstanding resistance to aging and obsolescence of basic principles.

How It Operates

The GSN-11 is a computer data processing and display system which obtains its input information from an electronic unit, such as the AN-178-3. When an aircraft approaches the terminal area roughly 90 mi. out, the pilot requests a landing assignment and identifies his arrival on the GSN-11 radar console steps by means of a se-

quence or using his radar beacon. A human operator at one of three arrival consoles is assigned to the arrival and attaches a landing gate to its radar display using a "light gun." (See photo above.) The landing gate continuously follows the aircraft's path, providing the computer with information as to its position and velocity. Each of three arrival consoles operates on the GSN-11 can handle up to six aircraft.

Based on the new arrival position, altitude and speed, the GSN-11 computer promptly calculates the earliest possible time that the aircraft could arrive at the approach gate where it begins its IFR or GCA approach, if it were to fly a straight-in path. This is displayed by means of lights on the panel of the monitor console operator. He maintains his panel until it is open, he assigns it to the new aircraft.

If the earliest possible time already has been given to another aircraft, the human operator assigns the new arrival the next earliest available position. The GSN-11 then computes what path stretching maneuver is required to shift the new arrival sufficiently to bring it into the approach gate at the assigned time. Simultaneously, the computer calculates what heading the new aircraft must take up to put it onto the assigned flight path.

This required heading is transmitted automatically to the aircraft by means of an automatic voice relay (AVR),



Flight Propulsion NEWS

A report about progress in research and development for the Flight Propulsion Division of the General Electric Company



Aero Commander Model 113B



Boeing-Anderson SAAC 25

CJ610 Selected to Power Executive Jet Aircraft

LYNN, Mass.—Two General Electric CJ610 turbojet engines will provide power for two business aircraft recently announced by Aero Commander, Inc., and Boeing-Anderson Aviation Corp.



Simplification of CJ610 design, which is nearly identical to the proven military J65, provides easy inspection, maintenance and assembly.

The two state-of-the-art executive aircraft will bring Jet Age speed and improved range to the expanding corporate aircraft market.

Aero Commander's Model 113B, known as the "Jet Commander" and Boeing-Anderson's SAAC 25, can cruise over the weather at speeds in excess of 800 mph. Their CJ610 engines developed specifically for use in business aircraft, will enable both to operate from the same fields as those used by present-day propeller-driven aircraft.

Rated as powerful for the "Jet Commander," the CJ610-1 version produces 1500 shp in the guaranteed thrust. The CJ610-2B, to be used in the SAAC 25, produces 2400 shp in the guaranteed thrust.

Both versions are compact in design and measure 39.7 inches in length and 17.7 inches in diameter. Both will be FAA certified in 1965.

The CJ610-2B is also being used in studies by Boeing Aircraft Industries as the powerplant for its B-105C executive jet.

Power of the CJ610 engine is lower than that of any comparable engine in the market.

The high performance CJ610 turbojet is one of the commercial derivatives of the proven military J65. With a history of nearly 30,000 jet hours, the J65 has demonstrated versatility and reliability as the powerplant for Northrop's operational T-39 "Tweet" trainer, McDonnell's OA-53 "Quail" command, and operational with the Strategic Air Command. Redesignated Q4B, superior target drone, and the experimental VTOL X-14A.

For additional information on the CJ-610 write for Bulletin GED-6612 E.

30-Kw Plasmajet Engine Tested Successfully

CINCINNATI, O.—A 30-Kw arc jet engine for space propulsion has successfully completed initial performance tests at General Electric's Flight Propulsion Laboratory.

Work on the engine is being performed by the Nuclear, Astronautics and Space Administration. The electric engine is designed to produce thrusts of the order of 8.5 lbs for extended periods of time, making it suitable for a number of functions in space.

Under another program—also being performed for NASA—General Electric is preparing the most attractive concepts for the propulsion system, generating atomic beam thrusters, transfer to stationary satellite orbits and maneuvering satellite stabilization functions. Power for this engine will be supplied by the SNAP VII nuclear turbopropulsion system.

In principle, arc jets are similar to chemical rockets, except that the acceleration of mass is accomplished by an electrical energy input, rather than a chemical reaction. This allows the arc jet to operate at very high specific impulses, three to four times the value of chemical systems.

Because of its low propellant consumption, the electric power propulsion system produces very significant economies in useful payload payloads—work the designers now under development.



Model 340 turboshaft is scheduled to power U.S. Maritime Administration ED-10, 60-knot hydrofoil land this year. Dynamic Development, Inc. is building the vessel.

Model 240 Engine Completes Tests; Goes to Grumman for MARAD Craft

CINCINNATI, O.—General Electric's Model 340 turboshaft engine, slated to power the U.S. Maritime Administration's 60-knot hydrofoil vessel, it, will provide this summer, has completed qualification testing.

The engine produced over 16,000 shaft horsepower at 6000 rpm. All vibration levels were within design limits and surface blade stresses were below limits for all tested operating conditions.

Following completion of the tests, the engine was shipped to Dynamic Development, Inc., an affiliate of Grumman Aircraft Engineering Corp., at Baldwin, N. Y. Dynamic Development is under contract to deliver the 60-knot hydrofoil to MARAD this year.

G.E.'s Model 240 engine is part of a complete power package the Company is offering for marine propulsion. The package includes engine powerplant, transmission, and shafting engine.

The basic Model 240 engine is a turboshaft version of G.E.'s proven CJ-805 commercial turbojet. The basic engine weighs approximately 6600 pounds, only one-sixth as much as similarly rated nonpropulsion engines and aircraft propulsion systems.

General Electric's test facilities at Erieville, Ohio, where the Model 240 proved qualification, includes three power braked engines at generating 23,000 shaft horsepower. The Model 240 tests represented the first time such a system has been used with a large turboshaft engine.

CI-805-23C Certified by FAA

CINCINNATI, O.—General Electric's CI-805-23C sh-ten engine has been awarded Federal Aviation Type Certificate number 1B.

The 10,189 gross thrust class CI-805-23C will power the Red Arrow/Corvette V-10, scheduled to make its first flight in June. In this year, General Electric has been flight testing a Corvette with sh-ten engines installed since December, 1960.

FOR MORE INFORMATION

If you would like additional information on these G.E. flight propulsion programs, write General Electric Company, Section 204-26, Schenectady 5, N. Y.

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Convair 880: Three speed records, 1200-hour engine TBO in first year

CINCINNATI, O.—The 615 mph Convair 880 jet airliner helped three airlines set commercial speed records during its first year of scheduled service ending May 28, 1964.

The first speed record was claimed by Delta Air Lines during delivery of their retail 880. The aircraft noted the 2159 miles from San Diego to Miami in 3 hours 31 minutes to set a southern transcontinental speed mark. Average speed was 655 mph.

Last fall, an 880 destined for North-east Airlines set the 2720-mile "coast-to-coast" transcontinental record from San Diego to Boston in 4 hours, 10 minutes.

In coast-to-coast record from San Diego to Boston in 4 hours, 10 minutes.

Most recently, Texas World Airlines posted the record return when an 880 Superjet flight set a commercial record of 2 hours 57 minutes for the 1620 miles between San Francisco and Chicago. Scheduled time: 3 hours, 38 minutes.

In another first year development, the FAA recently granted Delta Air Lines a 1200-hour Time Between Overhaul for the General Electric CJ-345-3 turbojet engines powering the Delta

880 fleet. The authorization also included a TBO of 1200 hours for engine accessories and controls. The increase



TWA 880 Superjet hit 720 mph to set 1200-hour San Francisco-Chicago speed mark.

engine TBO in first year

was granted in accordance with the FAA's Turbine Engine Time Control Program, which permits TBO extension.



Delta 880 averaged 655 mph, setting southern transcontinental speed record.

tion of 200 hours when engine shutdown rates of less than 1 per 10,000 flight hours are demonstrated.



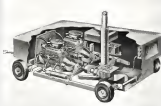
North-east 880 set "coast-to-coast" San Diego-Boston record in 4 hr. 10 min.



FOR THE MAINTENANCE PROGRAM—An environment cooling pack. Delivers 25 tons/hr of air at 27°F and 2.5 p.s.i. for B & D testing.



FOR THE TITAN II PROGRAM—An air conditioner which simultaneously heats and cools. Provides control gear in rear and for sections of the missile while in the air.



FOR AN ADVANCED TURBOJET ENGINE—A new mobile starter system. Operates directly with engine's glowcoils. Offers a wide range of starting torques and speeds.



FOR AN ADVANCED FALCON MISSILE—An automatic liquid chiller. Cools or heats electronic components, during ground checkout.



FOR THE NAVY F8E & F-4E ENGINES—A complete jet fuel control test stand. Supplies fuel flow up to 6,500 lbs/hr at 1,500 p.s.i. This variable air flow temperature range from -65 to +200°F. Simulates 100 C.V.



FOR THE C-119 & B-57CRAFT—A simulator which can make 100 start-run tests in minutes.



FOR THE B-56—A run stand for functional check out of the plane's temperature control components.

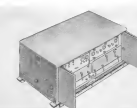


FOR THE AIR FORCE AND NAVY—A propeller spin-chamber test stand for 2- and 4-engine aircraft.

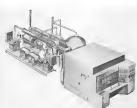


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Two facts you should know about this GSE



FOR THE TITAN II PROGRAM—A pumping and metering unit for transfer of propellant fuel and oxidizer.



FOR THE F-105—A pneumatic test stand. Simulates flight conditions to functionally check the plane's air conditioning system during overhaul.

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ALL METAL: Mooney Mark 21, it powered by a 100-hp Lycoming O-360-A1A engine fitted with a McCauley constant speed propeller.

Aviation Week Pilot Report:

Mooney Mark 21 Shows Performance Gains

By Andy Kall

New turbo-larger and light characterizes all of the all-metal Mark 21 is an unexpected bonus for Mooney Aircraft Co. and adds performance to its search for the most-and-rustic construction of the Mark 20.

Mooney engineers believed that one can drive from the window wing and can purchase of the Mark 20 to do all-metal construction of the Mark 21 would have no influence on the performance of the new aircraft. Meanwhile in the planned and aerodynamic discussions were also noted. With the concerns implemented only to eliminate production bottlenecks, the improved climb and stall characteristics as well as the unsatisfactory turning performance of the Mark 21 are attributed by Mooney engineers to the stiffness of the all-metal structure.

The new Mooney Mark 21, first design sketch of which was reported in November 1978 Jan. 16, is a four-place

low wing aircraft 9 ft. 4.5 in. high and 25 ft. 2 in. long, powered by a 100-hp Lycoming O-360-A1A high compression engine designed for 90/96 octonon needed 100/110 octonon, produce with a McCauley constant speed 74 in. diameter alloy propeller.

Fuselage Design

With a small dorsal fin marking the only difference in appearance from the Mark 20, this four-seat Mooney fuselage consists of a solid chrome-molybdenum steel tube frame, with aluminum skin flush mounted thereon. The fuselage tail cone section has been redesigned for composite construction for added strength with a spring steel tail fin and protection against a tailfin landing, and a tailcone ring attached to the lower section of the tailcone rear bulkhead.

The baggage compartment capable of holding 120 lb. of baggage, is accessible from the inside from a right hand door aft of the cabin door.

The baggage door is made both as and water tight is a full length power hinge mounted canopy and rubber mounting.

Temporary construction is similar to the wing in that it is fully reinforced with a single main "Z" spar with the steel die stretch formed and wrapped in aluminum, on the lips is a spar wire structure. Flush ribs are used wherever necessary to eliminate drag.

The 79 sq. ft. vertical stabilizer is constructed with an offset of 10 deg. to compensate for torque. The horizontal stabilizer has 21 sq. ft. area with the elevator and aileron 12 sq. ft. and 7.00 sq. ft. is an inter-digital. Rotation of the pilot's main wheel around the tail cone and emergency via a linkage tube extended back to a screw-pull assembly. Movement of the entire tail on passage clearance the day of the standard trim tabs and keeps the vertical stabilizer perpendicular to, and the horizontal stabilizer level up with, the line of flight.

This modification is also responsible for positive rudder and elevator control right through the stall speed range.

The new metal wing, with a span of 35 ft. and a total area of 187 sq. ft., is built as a complete unit with each bulkhead forming a fuselage box which distributes the wing load evenly over the entire wing area. Two 31-pd. fuel tanks are formed as an integral part of the wing by making of the forward section of each wing fit the root area.

Three sections of main spar-mounted flaps span 155% of the trailing edge of the wing and have a total area of 17.2 sq. ft. Ailerons have a total area of 11.2 sq. ft. with all gaps between controls and attaching members sealed to prevent deterioration of the air flow. Positive direct connection to control surfaces is provided by linkage push-pull torque tubes which eliminate the slack normally associated with cable control. Flaps are fed from one tank at a time, via aluminum fuel lines, through the selector valve on the floor beneath the pilot's seat to the individual fuel where it then passes through the fuel line to an engine driven pump and the carburetor. An auxiliary electric fuel pump is also provided for take-off, landings and emergencies.

The manually operated landing gear has long-type springs in the fuselage and gear strut springs in the wings to assist in the reduction and lowering of the gear. New over-center-lock springs positively force the down locking mechanism into place when the gear is lowered. The attachment points of the main gear are in a fixed landing attached to the gear is such a manner that the gear will not loose if shock is severe rather than prevent it to penetrate the



MARK 21 fuselage consists of solid chrome-molybdenum steel tube frame with aluminum skin. Fuselage tail cone section has been redesigned for added strength.

fuel tank. The steerable nose wheel is attached to the cabin's tubular steel frame and not to the engine mount. The magnesium cast main wheels have a 9-10" tread and are equipped with an imple type and hydraulic (petroleum base fluid) double-acting, air-actuated disk type brake shoes.

The 12-volt electrical system uses a Delco-Remy starter, 50 amp Delco-Remy generator, Robert 30-amp battery and the new Bendix \$220 "doser of wheels" type magnetic starter. The engine is provided with a separate electric fuel system and will continue to run even though the master switch has been turned off or should the accessory electrical system fail. Should it be necessary to start the engine manually, a switch to disconnect the starter is provided on the upper section of the fuel tank next to the starter vibrator.

Entrance to the Mark 21 cabin is via a retractable step and right wing walk-up. The step vibrates completely into the wingroot frame, eliminating drag. Step vibration is independent of the landing gear and is accomplished via two and a half turns of a crank located on the cabin wall opposite the pilot's left knee. Failure to release the step will result in an unneeded penalty of 5 mph.

Compact Cabin

The compactness and "turbo-boost" features of the cabin are evident as the starting procedure are initiated. After adjusting the pilot's seat for comfort it was not necessary to lean forward in the seat to harness switches or adjust levers.

Instrument grouping on the shock-mounted panel follows the accepted standard of placing flight instruments on the left with radio equipment on the center panel and engine meters on the

right, with landing gear, wing flap and fuel flap controls grouped under the center panel.

The four-cylinder engine was started and the aircraft taxied out for engine run-up. Wide visibility was provided by the large window area and flexible attitude of the plane while taxiing, with responsive control of the aircraft provided by the steerable nose wheel and hydraulic toe brakes.

Completing run-up procedures, clearance was obtained from Teterboro Airport, N. J. with engine idling, steady climb temperature 50 deg. F and altimeter setting 30.00.

Take-off was initiated by the throttle in full power at 2,700 rpm, the aircraft accelerated to 65 mph in two back, pressure was applied to lift the nose wheel off the ground. The Mark 21 broke clear of the ground at an indicated air speed of 70 mph, back pressure was released on the control as it is picked up climb-out speed of 170 mph.

Gear is retracted by sliding the gear handle from the "down lock" position under the master panel and by pulling the gear handle down in the flow between the pilot's feet, sliding the handle into the "up-lock" position. As the gear is raised manually, a slight resistance is met when moving the gear back, through the air flow the pedal to the flow in the spring action is over come.

After retracting the gear, power for climb-out was set at 23 in. of manifold pressure and 2,000 rpm, which established the aircraft in climb at an altitude of 3,000 ft. at a rate of climb of 1,100 fpm at a steady 110 mph.

At 3,000 ft. the Mark 21 was trimmed and powered for cruise. 22.5 in. manifold pressure and 2,300 rpm. (71% power) the aircraft was

1961 Mooney Mark 21

FAA Type Certificate 2413

Maximum gross weight 2,450 lb.

Empty weight 1,490 lb.

Maximum baggage capacity 120 lb.

Wing loading 54.6 lb./sq. ft.

Power loading 15.6 lb./hp.

Maximum air speed (gross weight) 190 mph.

Maximum cruise speed (75% power) 150 mph.

Cruise at 2,400 rpm at 7,500 ft. 130 mph.

Optimum cruise speed 167% power 157 mph.

Cruise at 2,300 rpm at 7,500 ft. 130 mph.

Emergency cruise speed (55% power) 110 mph.

at 2,200 rpm at 10,000 ft. 114 mph.

Stall speed (power off, landing gear and flaps down) 87 mph.

Rate of climb (sea level) 1,100 fpm.

Best normal climb speed (gross weight) 105 mph.

Best climb speed (gross weight) 105 mph.

Service ceiling 20,000 ft.

Normal range (at 3,000 ft., no wind) 915 mi.

skid away easily when handled without care. The compressor had burned while fixed on the ground. The left wing support was. Examination of the engine for re-ignition wires showed that the selective wires were in three normal positions and that none of the five handles had been dis-
clipped by crew action.

The postman's statement of the physical evidence can be summarized as follows:

• Bright light was indicated to the crew room, ahead portion of the left wing, causing loss damage to the left main door view of the wing leading edge and seating of the left wing loading.

• Tail No. 2 had tank dented to no trace of external pressure or explosion shrapnel fragments were located in a random pattern.

• The left ribbed leading edge, the boom platform and the rear spar showed that the left wing failed at the ribbed one-third of the No. 2 tank in upward bending and tearing failure. The relatively small fragments of the upper plating indicated a strong probability of failure resulting from a high positive load.

• The wing station No. 37 during tilt of the left leading edge showed some internal fractures. Monomogor examination disclosed there to low degrees of distortion in these portions mostly vertical marks.

• The fracture lines at lower wing station No. 1 at wing station No. 65 left, showed evidence of having occurred early, either after the fracture occurred. Monomogor examination to reveal at least three cycles of fracture.

• The forward attach point of the No. 1 (BEC) upper carbide lagging showed heavy compression leading pins to bulging and further disclosed multiple distortions of level leading to the second lagging attachment.

• The forward attach area of the No. 1 (BEC) upper carbide lagging revealed a tension failure followed by a movement of the fracture from a weak to compressive load.

• The electrical connections and their routing at the No. 1 missile showed some failure in multiple directions of bending.

• At the No. 3 forward the fuel line was bent upward and downward bend pins to eliminate failure which was anticipated.

• Fixed on the No. 1 missile dented were indications which were made by the material available during hours. There were also multiple clamp marks around the dented base gas pressure tank base at the clamp applier.

• Bolt No. 1 gas hot load mounts showed evidence of repeated yaw loads and some evidence of warping. The rear center disclosed extreme relative motion of the mount with respect to the missile structure.

• The No. 3 engine's fuel meter component holder rubbed the inside of the rear air meter housing.

• Examination of the structure for fatigue produced completely negative results.

In reference to the brokenness of the left ribbed wing the is mentioned it

wasn't proper to present the following. At one point there is found a continuous line or bent pattern across the rear portion of the wing, particularly along the rear the back side of which is white, and the upper leading edge surface. The white side of which is white. This material ran down two of the flap hinge flap station No. 178 and flap station No. 106, showed some staining however, the rest may not have continuous across both lines. The ribbed flap hinge at wing station No. 77 was also plucked clean. This bend went into the main winging area a rib the upper station. The flap themselves had five portions on them, however at one point where there was a low pattern it could be shown that did not run past to the leading edge of the flap and most of this flap occurred in the area where the flap was torn through as a result of a wing failure. Behind of the station No. 77 flap hinge there was evidence of rubbing for and each would be expected since there was a hole at the point through the area at the base of wing leading.

The web point of which line or bent can get into the rib area on the rear portion of the wing is through a small opening under the rib and shows the position point of the upper cup of the cut goes to the leading edge. This area was completely clean and showed no evidence of wear, let, or heat. This area incidentally, is white and smooth clean and very smooth. The web other was to get bent into the rib area from external would be through the leading edge and through a small opening from the leading edge onto the BSA area, however the did not get noted as injury. It was noted during the inspection period that the trailing portion of the wing after makes a strong or forced capable of leading several films of kerosene, and ahead of this area there is a place where additional fuel could be injected for a short period of time.

The cold conditions to be noted during the flight might actually be considered possible.

Any comprehensive analysis must consider along with the positive evidence in the wreckage the following negative points:

- In the BSA side and in the compressor the end, examination shows indicated with an occurrence No. 1 pump pump and the bending of a forward strip. This was only to a certain area in the engine.

- There was no evidence along the axis of the flight in separating obstacles.

- There was no record of this aircraft being subjected to a hard landing or to any appreciable turbulence during its 700-plus hours since manufacture. There could be found any one incident of any possible maintenance of the wreckage. This occurred on September 22, 1958 during a training flight wherein the pilot entered a maneuver well following an emergency circuit and crossed the Vee threshold of damage resulting from the maneuver has been evaluated and discussed under "the conclusion."

- Nowhere in ARTC records there was any conflicting info of aircraft operating on flight plan. The U. S. Navy said and that there was no aircraft operating into the early Navy facilities in the area and facilities that no other Navy command had an only operating in the vicinity of Bufile. The Air Force reported no local flights



SKYBOLT



This new USAF weapon now under development will combine the range and mobility of the jet bomber with the speed and the difficulty to detect, capabilities of the ballistic missile. Yet Skybolt's central-carrier, re-entry vehicle, must operate with the same mobility and accuracy of ground-launched re-entry vehicles.

Environmental conditions—The re-entry vehicle must withstand hour after hour of vibration and noise impact aboard its hoster "launching pad"—the USAF B-52 and the SAC Vulcan bomber. Its heat protection system must reduce expected thermal cycling from ground take-off temperatures to -65° F at cruising altitudes. It launched it could be exposed to re-entry temperatures of 7500° F.

Extended life—Skybolt's re-entry vehicle must have a useful life of several years, through repeated storage, thermal cycling, and return to storage—all with a minimum amount of maintenance.

The Skybolt missile system is being developed from known and proven engineering principles, resulting in rapid program advancement at great savings to the American taxpayer. The Missile and Space Vehicle Department of General Electric's Defense Electronics Division is developing Skybolt's re-entry vehicle.

GENERAL ELECTRIC

SKYBOLT is being developed to add a new dimension to America's growing missile might. Launched from an airborne B-52, it is being designed to arc through space toward targets more than 1000 miles away. The re-entry vehicles for this advanced USAF missile are being developed by General Electric's Missile and Space Vehicle Department under contract to Douglas Aircraft Company, prime contractor for Skybolt.

GENERAL ELECTRIC

providing for the future of national defense...

RCA advanced military systems Princeton, New Jersey

New beginning in third year, RCA's Advanced Military Systems organization is deeply involved in developing new systems concepts that will satisfy military requirements expected to arise later this decade.

These studies probe the frontiers of knowledge and encompass such areas as the physical sciences, mathematics, engineering, and military science. They have, as their end result, the creation of advanced systems concepts applicable to such military areas as SPACE, COMBAT, WARFARE, LIMITED WARFARE and PLASMA APPLICATIONS.

Members of the technical staff are relieved of administrative detail, and devote their time primarily to purely creative work. They are able to draw heavily on the most capable talents of other departments of RCA, particularly the operating divisions of Defense Electronic Products. In addition, specialists may be called in as needed.

Their offices are in a new air-conditioned building on the spacious grounds of RCA's David S. Ross Research Center. The center, at Princeton, NJ, offers secure administrative, technical and civil advantages—and is conveniently close to New York City.

At this time, AES is seeking a few senior theoretical scientists, engineers and mathematicians who have attained recognition in the fields of SPACE, OF PLASMA APPLICATIONS, OR STOCHASTIC AND COMBINATORIAL PROCESSES. If you have at least 15 years of experience and education beyond a bachelor's degree; if you are systems oriented and interested in working in an environment offering every opportunity and facility to use your creative and analytical skills to maximum advantage; and at the highest level, we should like to hear from you. Write:

Dr. M. J. Keenan, Director
Advanced Military Systems, Dept. AM-61
RCA Corporation of America
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All qualified and
interested persons
will receive an
answer, either by
mail or by phone.

of the accident immediately after occurrence. An investigation was started at once in accordance with the provisions of the Federal Aviation Act of 1958. A police hearing was ordered by the Board and held in Dallas, Texas, on October 21, 1959, and in Dallas, Texas, on March 9 and 10, 1960. Russell Aeronautics, Inc., is an Oklahoma corporation with its principal office in Dallas, Texas. The owner holds a certificate of public convenience and necessity issued by the Civil Aeronautics Board and is an air carrier operating certificate issued by the Federal Aviation Agency. These certificates authorize the carrier to engage in the transportation of persons, cargo and mail within the United States, including the route involved.

Flight Personnel

Carter William Elton Stone, age 47, was employed by Boeing Aircraft Co. on April 12, 1959. He held a currently effective airline transport pilot certificate number 416475 with class ratings in DC-1, DC-3, DC-4, DC-6, DC-7C, DC-8, DC-9, DC-10, DC-12, DC-14, DC-15, DC-16, DC-17, DC-18, DC-19, DC-20, DC-21, DC-22, DC-23, DC-24, DC-25, DC-26, DC-27, DC-28, DC-29, DC-30, DC-31, DC-32, DC-33, DC-34, DC-35, DC-36, DC-37, DC-38, DC-39, DC-40, DC-41, DC-42, DC-43, DC-44, DC-45, DC-46, DC-47, DC-48, DC-49, DC-50, DC-51, DC-52, DC-53, DC-54, DC-55, DC-56, DC-57, DC-58, DC-59, DC-60, DC-61, DC-62, DC-63, DC-64, DC-65, DC-66, DC-67, DC-68, DC-69, DC-70, DC-71, DC-72, DC-73, DC-74, DC-75, DC-76, DC-77, DC-78, DC-79, DC-80, DC-81, DC-82, DC-83, DC-84, DC-85, DC-86, DC-87, DC-88, DC-89, DC-90, DC-91, DC-92, DC-93, DC-94, DC-95, DC-96, DC-97, DC-98, DC-99, DC-100, DC-101, DC-102, DC-103, DC-104, DC-105, DC-106, DC-107, DC-108, DC-109, DC-110, DC-111, DC-112, DC-113, DC-114, DC-115, DC-116, DC-117, DC-118, DC-119, DC-120, DC-121, DC-122, DC-123, DC-124, DC-125, DC-126, DC-127, DC-128, DC-129, 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LETTERS

Soviet Record Claims

Due to the uncertainties surrounding the so-called standard orbital space flight made Apr. 11 by Ravan, how can a world record be claimed solely on documentation furnished by Ravan?

The first manned orbital space flight is too important an event to be accepted as a world record without having reliable and thorough proof.

Other nations allow the Federation Area statistics internationally to have representative from within and ready mechanical and space records.

If Kansas finds the is desirous of having world record class recorded then the should be willing to have 1/4 of 1 percent of land to make certain the class are worth more than the paper they are written on.

Let the church speak for truth and not for the sake of propaganda.

Tungsten Institute
1912 Humboldt Avenue
Wheaton, Ill. U. S. A.

Defense Concepts

McNamara's Rand-Cor strongly opposed Secretary of Defense McNamara. His his predecessors, he became a military expert by reason of appointment. The concept of defense is clouded by his somewhat background which prices through the hole in his scoring. The most serious criticism with the lowest cost defense system may be good responses but is not the ideal state of preparedness. Economical more article hole into most.

We need a nuclear potential but it may well fall into the category of gas works, which all constituents oppose but none are free of retaliation.

If we are to have an A-1 Force to assemble and set to duty on mobile rocket-launchers, then the billions of dollars spent on our early warning system are of questionable value in the reliability of the equipment and the interpretation of information received. We wish that there could exist a small margin of doubt which would delay action until we were in the midst of an atomic holocaust before we could in slow maneuvers, push the buttons to destroy each other.

McNamara states two objectives—(1) "A long-endurance search" and (2) "A strategic strike for immediate delivery of conventional weapons." In regard to the first objective, why did the Administration kill the Nevada Nuclear Proliferation project, which was and is the closest answer to the goal? As to the second objective, may we suggest a model B-17 bomber as the means against the destructiveness of a nuclear explosion in comparison for its lack of accuracy and a B-17 is as close to a B-1

Attention Word recognizes the opening of its readers on the lines typed in the computer's editorial columns. Above letters to the Editor, *Attention Word*, 330 W. 42nd St., New York 36, N. Y. Try to keep letters under 300 words and give a precise identification. We will not print anonymous letters, but names of writers will be withheld on request.

as a B 12 is to a B 70 bomber in range and speed—I'm certain that it is proportionally, nearly, most economical.

If we are to equip all the officers and members of our military academies who have made strategy and logistics of war their life work and by doing so, making sense of the chaos of the political process, we must first of all, restore to our defense effort, the whole nature of our defense effort, we will end up with the capability of the Cuban command force.

The S-V program should have at least changed from the "Manned Menace" to the "Winning Formula." The Eisenhower Administration ran the program in a shell and ignored all of the coordination costs brought about by the stoppage of well advanced development work in subcontractors all over the nation. Thus came the armed hate of the Wright brothers, the U.S. which passed that high flying aircraft over Germany to the firm Curtiss and the expense was reduced not by a congressional committee committee, at which the present Vice President was a member.

The BTA program was sacrosanct and sacrosanct, with no realistic likelihood other than political expediency. The program has again proved effective and cost-effective. The most expensive thing about the BTA is not the program itself, but the political system.

If they must play politics, don't do it with our very existence on the line of this earth, because I don't believe we can all get into hell!

—Scott F. Thurman

7301 Harding Avenue
Van Nuys, Calif

'Fair Share of Market'

Much of our current news expounds efforts to obtain "Fair Shares of the Market." Detroit manufacturers outline their battle in obtaining their fair share of the market; national politicians propose to assure their own of their share of the economy. Local politicians assure would-be voters that if not in Washington they will work to work obtaining a fair share of the would-be market for home state to assure continued employment. Legislation to guarantee small business a fair share of the market is fast made, such as, small. Much trouble, too, over

This effect may be good, however, it would appear that the "Fair Share of the Market" approach relies rather than on courage, progress, or societal outcomes as solely effective. The expression "Fair Share of the Market" tends to derive allocations by right of entitlement rather than by competitive superiority. This complex and troubling, in our view, of life, that we need most is useful to derive what we have, and we give great comfort to world consumers.

ness. That conspiracy has certainly allowed communism to spread its tentacles of influence in the very doors of the United States.

The search industry, as others, has been hoodwinked into an erroneous belief that economic distress or the answer to an economic problem. The popular attitude is that the demanding funding for search is allocated on a purely political basis. It matters, only tangentially whether the attitude is justified even if (the industry) is then taken completely online. Focus on the cost of strategies will complicate, directly or by proxy for situations other than a political or "employment desire" strategy.

Self-examination defects were in which most of us can improve our productivity. Without this individual improvement and, especially, the substance for the need of it, the advancement of the economy can not be accomplished. Likewise, our various companies or corporations cannot effectively compete in the business world without this individual effort toward improvement.

Much emphasis has been placed on the advancement and regulation of machinery. However, machine, alone are not the answer. The success of machine productivity must be coupled with improved individual productivity, to accomplish leadership. This is exemplified by the increasing portion of the world market which is being lost to for-

The resulting world economy is not a product of inheritance by virtue of being

newspapers, but rather the product of different notions of the good. Reduced efficiency has diminished our level and will result in a complete loss of world leadership and

7301 Harding Avenue
Van Nuys, Calif

Lost Dollars

With reference to your May 12, 1961, note and the letter (Square Commemorative) you printed from Stephen de Font. Some-
body, Commemorative was who I must under-
standing having not been through a similar
conference, I would appreciate your printing
my most sympathetic "Dear Head".
If it will help the emphasis, let's try the
"Dear Head" in all case.

HILLARD L. LITTON
P O Box 545
Mason, Mass



Bell's Absurdity Argument Logical System—continued

CLEARED TO LAND, WEATHER OR NOT

Today's increasing air traffic demands faster and safer all-weather operation at every airport.

Bell brings this goal one important step closer with its All-Weather Automatic Landing System (ALS) which can fly two airplanes to touchdown every minute, even when visibility is absolutely zero.

The Bell ALS takes over when the pilot brings his plane through the electronic "window in the sky" and guides it to a safe and easy landing.

The system has been flight-proved in more than 4,000 landings with all types of aircraft—small private planes as well as airliners from the DC-3 and DC-7 to the large Boeing 707 jet. It now is being evaluated at FAA's No.

100

Naval Aviation Experimental Center, Atlantic City, N. J.
 Unlike other automatic landing systems, the Refl 4.1.0

is ground-based so a ground observer assumes every approach and landing. It can operate either fully automatically or under pilot control.

Military versions of the ALS have been ordered by the Air Force. The Navy has selected it for installation aboard the nuclear-powered aircraft carrier USS Enterprise as well as for its other large carriers.

and Bell Aerospace Company is making to the scientific progress and defensive strength of the free world. We invite qualified engineers and scientists to inquire about sharing our challenges and searching future.

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How SAC Multiplies Its Bomber Force For Less Than 2¢ Per Bomber Dollar

Against a strong enemy air defense force, the real story of American strategic striking strength is the number of bombers that can penetrate that shield and arrive over target.

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The GAM-72, an air launched decoy, duplicates the characteristics, radar reflection and performance of the parent B-52.

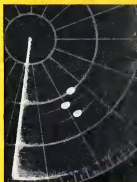
GAM-72 missile weapon systems now being delivered to operational squadrons by McDonnell cost less than 2% of the cost of the bomber they represent to enemy defenses.

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